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GRAND JUNCTION AND FRUITA, COLORADO

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16. ABSTRACT

Near the western border of Colorado, the Colorado River is the habitat of four threatened and endangered fish species as well as the receiving water course for sewage effluent from the cities of Grand Junction and Fruita. An extensive monitoring program was conducted to sample four water quality parameters which affect the concentration of un-ionized ammonia, a substance toxic to fishes at high concentrations. Temperature, pH, total ammonia and flow were measured for thirteen months along a 20 km reach of the river. Collected data and historical data were compared and analyzed to establish representative background conditions on a monthly basis. These conditions were then used to determine the monthly total ammonia loading allocations for the proposed wastewater treatment facilities at each of the two cities that would maintain a safe level of un-ionized ammonia in the river. This approach of seasonal waste discharge allocations avoids the unrealistic and costly "worst-case" conditions method conventionally used in the design of wastewater treatment plants.

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FOREWORD

This report includes and updates all data presented in a preliminary report entitled, Ammonia Toxicity Study in the Colorado River Near Grand Junction, Colorado, which was issued in April 1979. Data management and analysis for this report are identical to that in the preliminary report with one refinement: time adjustments for un-ionized ammonia were recalculated on the basis of the trend in diurnal temperature fluctuations observed during the course of the study instead of solely on the basis of winter intensive survey results. This report extends the analysis from the preliminary report. Historical water quality data are compared to the data collected during the 13-month study to determine representative river conditions. These representative conditions, together with the recommended instream ammonia criterion, enable the calculation of allowable ammonia loadings.

A meeting was held on 18 December 1979 at the Region VIII Office of the Environmental Protection Agency to discuss the preliminary results of this study. The following agencies were represented: U.S. Fish and Wildlife Service; Colorado Department of Health, Water Quality Control Division; Colorado Division of Wildlife; Henningson Durham & Richardson; City of Grand Junction; U.S. Environmental Protection Agency; and Engineering-Science. The applicability of the 0.02 mg/ℓ un-ionized ammonia criterion was discussed. It was pointed out by the representative of the U.S. Fish and Wildlife Service that fish toxicity bioassay studies are now underway to verify the applicability of this criterion. The Colorado Department of Health representative indicated that his department would probably utilize the 0.06 mg/ℓ criterion for warm water fishery protection in issuing a permit for the Grand Junction treatment plant, pending further bioassay results on fish similar to those deemed to be threatened and endangered. A study of nonpoint sources of ammonia into the Colorado River is also currently in progress.

TERMINOLOGY AND ASSUMPTIONS

The terminology used in this report for the chemistry of ammonia follows the convention used in Ammonia Toxicity (W. Willingham, 1976). Thus, "ionized ammonia" describes the chemical species NH_4^+, and "un-ionized ammonia" describes NH_3. "Total ammonia" or "ammonia" describes the sum of both forms ($NH_4^+ + NH_3$). For all three forms, ionized, un-ionized and total ammonia, concentrations are expressed as mg/ℓ NH_3-N.

For the purpose of this survey and report, it is accepted and assumed that 0.02 mg/ℓ as N is the highest concentration of un-ionized ammonia that will assure safety to the endangered fish species of concern. While this assumption may be questioned for certain conditions, use of a criterion is necessary to establish allowable ammonia loadings and has no bearing on the representative background conditions determined from the results of this survey.

TABLE OF CONTENTS

Page

Foreword iii
Terminology and Assumptions iv
Acknowledgments x

SECTION 1 INTRODUCTION AND SUMMARY 3
- Introduction 3
- Summary 4

SECTION 2 DESCRIPTION OF PROJECT 11
- Background 11
- Other Water Quality Studies Near Grand Junction 14
- Ammonia Toxicity 16
- Objectives 17
- Approach 18

SECTION 3 MONITORING PROGRAM: METHODS, RESULTS AND DISCUSSION 27
- Methods of Water Sample Collection and Analysis 27
- Results of Water Quality Sampling 29
- Discussion of Water Quality Results 31
- Methods of Flow Determinations 56
- Results of Flow Determinations 57
- Discussion of Flow Determinations 57

SECTION 4 HISTORICAL PERSPECTIVE ON REPRESENTATIVE CONDITIONS IN COLORADO RIVER NEAR GRAND JUNCTION 69
- Water Quality 69
- Flow 75

SECTION 5 AMMONIA LOADING ALLOCATIONS 91
- Conclusions and Recommendations 93
- Future Considerations 100

SECTION 6 REFERENCES 105

APPENDIX A WEEKLY WATER QUALITY DATA 109
APPENDIX B ADDITIONAL HYDROLOGIC DATA 177
APPENDIX C SAMPLE CALCULATION FOR AMMONIA LOADING ALLOCATIONS 191
APPENDIX D DYE TRACER STUDY 195
APPENDIX E INTENSIVE SURVEYS 207

Technical Report Data 215

TABLE OF CONTENTS (continued)

LIST OF TABLES

Number	Title	Page
1	Summary of Monthly Representative Background Conditions and Ammonia Loading Allocations	7
2	Gauged Flows at Stations 1,4,6,7 and 8	58
3	Discharge Flows at Grand Junction Treatment Plant	60
4	Monthly Ranges and Medians of Colorado River Water Quality Data, 1968-78, at Three Stations near Grand Junction	70
5	USGS Gauging Stations	76
6	Seven Day Low Flows Expected once in 10 Years	78
7	Average Diversions Grand Junction Area	80
8	Summary of Estimated 7 Day Low Flows to be Expected once in 10 Years for Colorado River	82
9	Representative Monthly Background Conditions in the Colorado River	92
10	Maximum Ammonia Loading Allocations to the Colorado River	94
11	Maximum Ammonia Concentrations in Wastewater Discharged to the Colorado River	97
12	Ammonia Loadings into Colorado River from Grand Junction and Fruita Wastewater Treatment Facilities in 1978-79	98
13	Maximum Ammonia Loadings to the Colorado River for the 0.06 mg/ℓ Standard	101

TABLE OF CONTENTS (continued)

LIST OF FIGURES

Number	Title	Page
1	Location of Study Area	6
2	Detail of Sampling Stations 3,4 & 5	20
3	Detail of Sampling Stations 6,7,8,9 & 10	21
4	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during September 1978	33
5	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during October 1978	34
6	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during November 1978	35
7	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during December 1978	36
8	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during January 1979	37
9	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during February 1979	38
10	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during March 1979	39
11	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during April 1979	40
12	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during May 1979	41
13	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during June 1979	42
14	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during July 1979	43
15	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during August 1979	44
16	Un-Ionized Ammonia Range and Median Concentrations along the Colorado River during September 1979	45
17	Un-Ionized Ammonia Concentration Weekly Range and Median from September 1978 through September 1979 at Station 1, Colorado River	46
18	Un-Ionized Ammonia Concentration from September 1978 through September 1979 at Station 2, Grand Junction Sewage Effluent	47
19	Un-Ionized Ammonia Concentration Weekly Range and Median from September 1978 through September 1979 at Station 3, Colorado River	48

TABLE OF CONTENTS (continued)

LIST OF FIGURES (continued)

Number	Title	Page
20	Un-Ionized Ammonia Concentration from September 1978 through September 1979 at Station 4, Persigo Wash	49
21	Un-Ionized Ammonia Concentration Weekly Range and Median from September 1978 through September 1979 at Station 5, Colorado River	50
22	Un-Ionized Ammonia Concentration from September 1978 through September 1979 at Station 6, Fruita Sewage Effluent	51
23	Un-Ionized Ammonia Concentration Weekly Range and Median from September 1978 through September 1979 at Station 7, Colorado River	52
24	Un-Ionized Ammonia Concentration from September 1978 through September 1979 at Station 8, Little Salt Wash	53
25	Un-Ionized Ammonia Concentration Weekly Range and Median from September 1978 through September 1979 at Station 9, Colorado River	54
26	Un-Ionized Ammonia Concentration Weekly Range and Median from September 1978 through September 1979 at Station 10, Colorado River	55
27	Gauged Flows for Colorado River at Broadway Bridge	61
28	Gauged Flows for Colorado River at Hwy. 340 near Fruita	62
29	Gauged Flows for Persigo Wash at Interstate 70	63
30	Gauged Flows for Little Salt Wash at U.S. Hwy. 6	64
31	Gauged Flows for Fruita Lagoon Outlet	65
32	Water Temperatures Monthly Median and Representative Conditions along the Colorado River near Grand Junction and Fruita	71
33	pH Monthly Median and Representative Conditions along the Colorado River near Grand Junction and Fruita	72
34	Total Ammonia Monthly Median Concentrations and Representative Conditions along the Colorado River near Grand Junction and Fruita	73

TABLE OF CONTENTS (continued)

LIST OF FIGURES (continued)

Number	Title	Page
35	Estimated Seven Day Low Flow Profiles, Colorado River	85
36	Estimated Seven Day Low Flow Profiles, Colorado River	86
37	Estimated Seven Day Low Flow Profiles, Colorado River	87
38	Estimated Seven Day Low Flow Profiles, Colorado River	88
39	Ammonia Loading Allocations in the Colorado River	96

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SECTION 1

INTRODUCTION AND SUMMARY

SECTION 1

INTRODUCTION AND SUMMARY

INTRODUCTION

Near the western border of the State of Colorado, the Colorado River is the habitat of four threatened and endangered fish species as well as the receiving water course for wastewater effluent from the cities of Grand Junction and Fruita. The major population center for Western Colorado, Grand Junction is part of the productive agricultural region known as the Grand Valley. Located nearby are large deposits of oil-bearing shale formations which, if developed as an energy resource, could lead to tremendous population growth before the end of the century. Yet whether or not oil shale is developed, projected increases in wastewater flows indicate that ammonia concentrations in the reach of the river between Grand Junction and Fruita may exceed levels toxic to fish and other aquatic life, further imperiling the endangered fishes. Development of oil shale resources and the resultant population increase could greatly intensify the problem.

These predictions for ammonia concentrations, identified in the Water Quality Management Plan, Colorado River Basin, are based on the estimated background quality of the river as well as on the projected wasteload. However, the background quality fluctuates seasonally; at certain times of the year, the background conditions are likely to lead to toxic levels of un-ionized ammonia, but at other times, they are not. Late summer, usually August and September, when the river flow is lowest, is

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the most critical period for potential ammonia toxicity problems. Thus, it has been proposed that ammonia wasteload allocations for the Grand Junction and Fruita wastewater treatment facilities be established on a seasonal rather than a yearly basis. This would avoid the unrealistic and costly "worst-case" condition and at the same time provide year-round protection for the endangered fishes.

The purpose of this study is to determine representative seasonal background conditions in this reach of the Colorado River on the basis of an intensive monitoring program and a review of the historical data. These conditions can then be used to establish seasonal allowable wasteloads which are not expected to cause harm to the threatened and endangered fish species. Both Grand Junction and Fruita are in the process of upgrading and expanding their wastewater treatment facilities, and the level of treatment--with or without ammonia control, seasonal or otherwise--must ensure protection of these fishes before federal funding can be granted.

Indigenous to this reach of the Colorado River, the four fish species of immediate concern are: (1) Colorado River squawfish, *Ptychocheilus lucius*; (2) humpback chub, *Gila cypha*; (3) humpback sucker, *Xyrauchen texanus*; and (4) bonytail chub, *Gila elegans*. The first two fishes are on the United States list of Endangered and Threatened Wildlife and Plants, and all four are listed in the State of Colorado document, "Endangered Animals Cooperative Agreement Application; Legal Authority, Program Description and Proposed Research and Management Plans" (November 1974).

SUMMARY

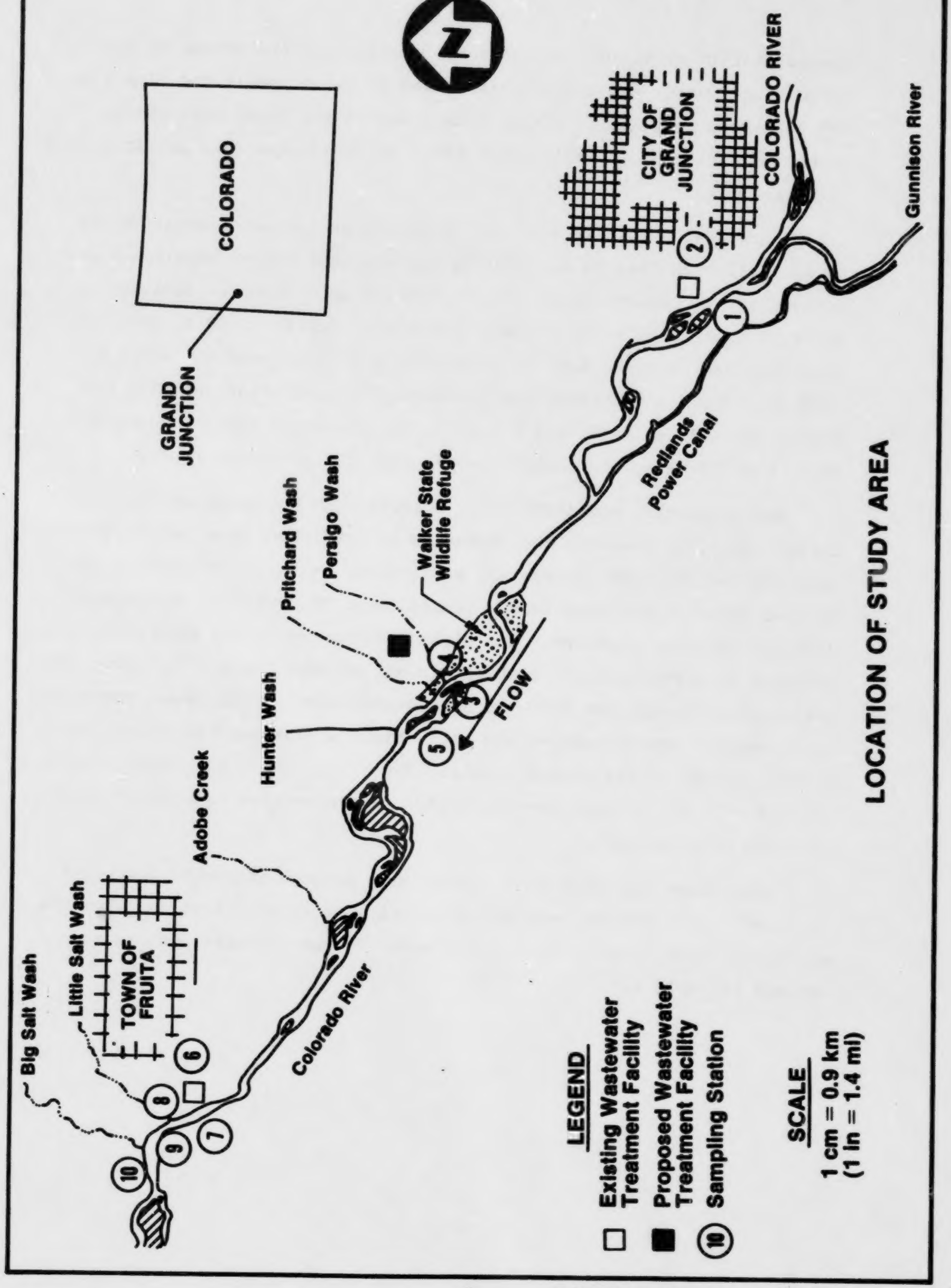
The monitoring program was designed to encompass one precipitation cycle, or water year, beginning in September 1978 and continuing through the end of September 1979. Water samples were taken weekly at ten stations along the river and tributary washes, 35 sites altogether including transect points. Samples were analyzed for pH, temperature and total ammonia concentration, which were then used to calculate the concentration of un-ionized ammonia. In addition, flow was gauged monthly at six of the stations. During the two months of low summer flow, water sampling was increased to twice weekly and flow gauging increased to weekly. Figure 1 is a map of the study area which shows the location of sampling stations; all collected data are presented in Appendix A.

Historical data were analyzed to determine the representativeness of the collected data (i.e., how typical were the survey results of conditions for the study area). The historical data examined include: (1) U.S. Geological Survey (USGS) streamflow data for 1960 to the present; (2) water quality data from the Colorado Department of Health for 1968 to 1978; (3) treatment plant records for both Grand Junction and Fruita for 1977 to 1979; and (4) data from the water quality management plan, the 208 plan, the facilities plan and the predesign report.

Representative conditions were selected, in the perspective of historical data, to describe a combination of conditions that would produce conservative, but not necessarily worst-case, estimates of monthly unionized ammonia concentrations. Temperature, pH, and flow all showed distinct seasonal patterns. The highest median value for each month was selected as representative temperature and pH conditions. For flow, the estimated seven-day low flow, to be expected once in ten years, was used. Total ammonia concentrations did not exhibit a seasonal trend in either the historical or the measured data. Therefore, the high median concentration of 0.18 mg/ℓ was used to depict representative background conditions in this analysis.

From these representative conditions, maximum allowable discharge of ammonia from the proposed Grand Junction treatment plant and from the existing Fruita facility were calculated. These calculations are summarized in Table 1.

FIGURE 1


N
COLORADO
GRAND JUNCTION
CITY OF GRAND JUNCTION
COLORADO RIVER
Gunnison River
Redlands Power Canal
Walker State Wildlife Refuge
Persigo Wash
Pritchard Wash
Hunter Wash
FLOW
Adobe Creek
Colorado River
TOWN OF FRUITA
Little Salt Wash
Big Salt Wash
1
2
3
4
5
6
7
8
9
10
LEGEND
☐ Existing Wastewater Treatment Facility
■ Proposed Wastewater Treatment Facility
⑩ Sampling Station
SCALE
1 cm = 0.9 km
(1 in = 1.4 mi)

LOCATION OF STUDY AREA

TABLE 1

SUMMARY OF MONTHLY REPRESENTATIVE BACKGROUND CONDITIONS AND AMMONIA LOADING ALLOCATIONS

Month	Temperature °C	pH[a]	Total Ammonia[a] mg/ℓ	Flow[b] m³/s			Maximum Instream Total Ammonia[c] mg/ℓ
				Grand Junction Whole River	Grand Junction North Channel	Fruita	
January	5	8.2	0.18	50.6	34.6	50.9	1.03
February	5	8.2	0.18	54.0	36.5	54.4	1.03
March	10	8.1	0.18	52.9	36.0	53.2	0.87
April	14	7.9	0.18	39.1	28.6	43.5	1.01
May	17	7.6	0.18	56.6	37.1	61.2	1.60
June	19	7.4	0.18	83.1	45.3	87.9	2.18
July	21	7.5	0.18	28.8	22.4	33.2	1.50
August	21	8.1	0.18	24.1	19.8	28.5	0.39
September	19	8.4	0.18	33.2	25.5	37.6	0.23
October	15	8.4	0.18	44.0	34.0	48.5	0.31
November	10	8.3	0.18	67.7	42.2	68.1	0.56
December	5	8.1	0.18	52.9	36.0	53.3	1.29

---

[a] Determined graphically from Figures 36, 37, 38.
[b] Estimated 7-day low flow to be expected once in 10 years.
[c] Corresponds to an instream un-ionized ammonia concentration of 0.02 mg/ℓ.

TABLE 1 (Continued)

Month	Maximum Ammonia Loading Allocations to the Colorado River[d] kg/day (lbs/day)			Maximum Ammonia Concentration in Wastewater Discharged to the Colorado River[e] mg/ℓ		
	Grand Junction[f]		Fruita[g]	Grand Junction[f]		Fruita[g]
	Whole River	North Channel		Whole River	North Channel	
January	3,700 (8,200)	2,500 (5,500)	3,700 (8,200)	78	53	782
February	4,000 (8,800)	2,700 (6,000)	4,000 (8,800)	85	57	845
March	3,200 (7,100)	2,100 (4,600)	3,200 (7,100)	68	44	676
April	2,800 (6,200)	2,100 (4,600)	3,100 (6,800)	59	44	655
May	6,900 (15,200)	4,600 (10,100)	7,500 (16,500)	146	97	1,585
June	14,400 (31,800)	7,800 (17,200)	15,200 (33,500)	304	165	3,213
July	3,300 (7,300)	2,600 (5,700)	3,800 (8,400)	70	55	803
August	400 (970)	360 (790)	520 (1,100)	10	8	110
September	140 (310)	110 (240)	160 (350)	3	2	34
October	500 (1,100)	380 (840)	550 (1,200)	11	8	116
November	2,200 (4,900)	1,400 (3,100)	2,200 (4,900)	46	30	465
December	5,100 (11,200)	3,400 (7,500)	5,100 (1,100)	108	72	1,078

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[d] These allocations are the maximum loadings from either treatment facility that would result in an instream un-ionized ammonia concentration of 0.02 mg/ℓ. They are NOT recommended loadings; neither are they to be considered additive for Grand Junction and Fruita.

[e] These concentrations correspond to the maximum ammonia loading allocations for the design flows of 47,000 m^3/d (12.5 mgd) for Grand Junction and 4,700 m^3/d (1.25 mgd) for Fruita. They are NOT recommended concentrations; neither are they to be considered additive for Grand Junction and Fruita.

[f] Grand Junction wastewater treatment facility only.

[g] Fruita wastewater treatment facility only.

SECTION 2

DESCRIPTION OF PROJECT

SECTION 2

DESCRIPTION OF PROJECT

BACKGROUND

The River

Water quality standards and stream classification for the study area are set by the Colorado Department of Health, Water Quality Control Commission. In the vicinity of Grand Junction and Fruita, the water quality for the main stem of the Lower Colorado River is classified B_2--suitable for warm water biota. The Colorado West Area Council of Governments has identified "the protection of waters for fish and wildlife...uses..[as] a major problem in the Lower Colorado River." Specific water quality parameters in the Grand Junction area which have exceeded state criteria, adopted in May 1979, include copper, iron, mercury, zinc, phosphorus, alkalinity, fecal coliform, total suspended solids, manganese, total dissolved solids, magnesium and pH.

The ammonia toxicity problem in this reach of the Colorado River was identified in 1975 in Water Quality Management Plan, Colorado River Basin (WQMP), prepared for the Colorado Department of Health. This plan was designed "to protect the quality of the Colorado River and its tributaries from point source pollution discharges" and examined the potential effects of projected wastewater flows for a twenty-year planning period. In the Grand Junction and Fruita area, it was found that ammonia concentrations in the Colorado River will exceed the "safe" level by the year 1993 with or without the population increases indicated by oil shale development. Recommendations were made for ammonia reduction either by nitrification of the effluent and/or by relocation of the discharge downstream where there would be

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additional dilution. Ammonia wasteload allocations were developed for summer conditons in the critical reach immediately downstream of Grand Junction. The maximum allowable ammonia wasteloads were defined as 580 lbs (260 kg) NH_3-N/day using population projections with oil shale development and 620 lbs (280 kg) NH_3-N/day without oil shale development. The WQMP also identifies this reach of the river as "effluent limited" and recommends changing the classification to "water quality limited" due to the high levels of ammonia. The plan designated the Grand Junction wastewater treatment facilities as a number 2 priority ranking for funding and the Fruita facilities as number 4.

The Grand Junction Wastewater Treatment Facilities and Discharges

Prepared the same year as the WQMP, Facilities Plan--City of Grand Junction, Colorado, examined several alternatives for upgrading wastewater treatment facilities to accomodate projected population growth for a twenty-year planning period. The City is currently served by a 22,000 m^3/d (5.7 mgd) trickling filter plant in town. The population in the planning area was assumed to increase from 49,530 in 1974 to 119,000 in 1994. The recommended plan proposed to modify the existing Grand Junction plant and to construct a new plant 9.5 km (6 mi) downstream which would discharge into Persigo Wash, an irrigation-return channel tributary to the Colorado River. The new plant would be a 25,000 m^3/d (6.7 mgd) activated sludge plant. Projected ammonia concentrations were calculated using this proposed scheme. Due to numerous uncertainties about river conditions and ammonia toxicity and the tremendous cost of ammonia control, such provision was not recommended. Thus, ammonia control was not included in the facilities plan. The plan, however, recommended that the City request "this segment of the river be reclassified or that exemption for ammonia removal be given."

The following year (1976) EPA issued a Negative Declaration on the proposed Grand Junction wastewater treatment facility. The Negative Declaration indicated that environmental impacts of the proposed project, including the level of un-ionized ammonia, would not be significant. Although the project deviates from the WQMP with respect to ammonia reduction, the Negative Declaration accepted the recommended plan with the following reasoning: the first phase of construction can be accomplished with no significant environmental impacts and can be done simultaneously with further study on the ammonia toxicity problem. The sparsity of water quality data and the necessity for further study precluded the decision requiring advanced wastewater treatment (i.e. ammonia control).

A technical update of the Grand Junction facilities plan was prepared in August 1977, entitled Predesign Report for Wastewater Treatment Facilities and Interceptor Sewers. Water quality problems were re-examined, and additional alternatives, including land application methods, were evaluated. Land application systems were rejected due to conflicting objectives for salinity control in the Colorado River Basin and the high cost of protecting groundwater supplies. The predesign report resulted in a recommendation to abandon the existing treatment plant (which reached design capacity in 1979) and to build a new 47,000 m^3/d (12.5 mgd) activated sludge plant at Persigo Wash. Allowable summertime ammonia-nitrogen discharge concentrations, on the basis of criteria developed in the WQMP, were re-calculated to be 1,170 lbs/day (530 kg) at points downstream of Persigo Wash, according to the newly proposed scheme. In other words, about 34,000 m^3/d (9 mgd) of secondary effluent could be discharged into the river without ammonia control. These calculations were based on the assumption that the background ammonia level during summer conditions would be 0.1 mg/ℓ. Thus, again, costly ammonia control was found to be unnecessary and was not included in the plant design.

In July 1978, EPA issued an Amendment to the Negative Declaration on the Grand Junction project to address the changes presented in the predesign report. The plan to phase out the existing plant and to construct a new 47,000 m^3/d (12.5 mgd) activated sludge plant at Persigo Wash was found not to have significant environmental impact. However, the issue of ammonia control was included in the Negative Declaration as a condition to the grant such that "results of the water quality study and other significant factors will determine if ammonia control will or will not be necessary on this project". The results of the study reported here are intended to answer this question.

The Fruita Wastewater Treatment Facilities and Discharges

Located 20 km (12.5 mi) downstream from Grand Junction, the Town of Fruita has an existing population of 3,800 compared to Grand Junction's population of 58,000. Although expected to increase nearly three-fold by 1983, the population of Fruita, existing and projected, is significantly smaller than that of Grand Junction. The town is currently served by a 15,000 m^3/d (0.4 mgd) aerated lagoon system which discharges into Little Salt Wash, an irrigation-return channel tributary to the Colorado River.

Because Fruita is located directly downstream from Grand Junction, the receiving water for Fruita's wastewater effluent is within the habitat for the endangered fishes where ammonia wasteloads are critical. Thus, the discharge of ammonia is a predominant environmental issue which is discussed in the 201 Wastewater Treatment Facilities Plan for Town of Fruita (September 1977) and the "Negative Declaration" (July 14, 1978).

Fruita's 201 plan examined six alternative wastewater management options and recommended expanding and upgrading the existing lagoon system to 4,700 m^3/d (1.25 mgd) to meet secondary treatment standards. Ammonia control was not included, with the rationale that if the Grand Junction treatment plant reduces its discharge of ammonia, then Fruita can meet water quality criteria with secondary treatment only. The Negative Declaration indicated that the environmental impact of the proposed project would not be significant. However, similar to the Amendment to Negative Declaration for Grand Junction, the Fruita document includes a condition to grant which is dependent upon the same "water quality study and other significant factors" to determine the need for ammonia control. Results of the present study are intended to satisfy this condition as well.

OTHER WATER QUALITY STUDIES NEAR GRAND JUNCTION

The U.S. Environmental Protection Agency

During 18 to 21 October 1976, the Technical Investigations Branch of the U.S. Environmental Protection Agency, Region VIII, conducted an intensive water quality study of a segment of the Colorado River near the Grand Junction Sewage Treatment Plant (STP). The purpose of the study was "to determine the existing in-situ concentrations of ammonia in the Colorado River due to the discharge from the Grand Junction STP during low-flow conditions." Results of this study indicated that toxic concentrations of un-ionized ammonia exist in the Colorado River downstream from the plant and that a 73 percent reduction in ammonia discharge from the plant may be necessary. However, the time of this study occurred nearly three months after the low-flow period. Because of this delay, extensive additional study during actual low-flow conditions was recommended to verify the conclusions of this study. In addition, a long-term monitoring program was deemed necessary to obtain a more complete understanding of the ammonia toxicity problem.

Colorado Department of Health - Water Quality Control Division

Water quality investigations were conducted on the Lower Colorado River from October 1973 through September 1974. Chemical, bacteriological and biological data were obtained at 23 sampling stations along 222 km (139 mi) of the river from Dotsero, Colorado to the Utah border.

Four of the stations are within the study area between Grand Junction and Fruita. All sampling at these stations occurred during the winter when water temperatures ranged between 0° and 1°C, and pH generally ranged between 8.0 and 8.4. The flow ranged between 153 and 156 m^3/s (5400 and 5500 cfs). Four samples taken in December and January were analyzed for ammonia, and no ammonia was detected.

On 16 and 19 September 1974, water samples were taken at the Grand Avenue Bridge and the Fruita Bridge. Temperatures ranged from 15°C to 18°C, and pH from 8.1 to 8.3. Only one sample was analyzed for ammonia, and again, no ammonia was detected.

Salinity Studies

In the immediate area of Grand Junction, extensive research is currently being conducted to study salt loading to the Colorado River. The U.S. Bureau of Reclamation, EPA, University of California at Davis, Colorado State University, and local irrigation and water companies are engaged in several projects to examine salinity sources and control measures near Grand Junction. Although not directly related to this study, the additional field information is enlarging the local water quality data base which may relate to upstream nonpoint sources of ammonia.

AMMONIA TOXICITY

Ammonia is an important nutrient present in all aquatic ecosystems and may be used directly by plants or may be converted to nitrate before uptake. It is a normal biological product from the degradation of proteins and is usually present in low concentrations. High concentrations of ammonia often occur in municipal wastewater effluent, industrial discharges, and agricultural runoff which are discharged into surface waters. High levels of ammonia in these waters can cause harmful effects such as increased oxygen demand, algal bloom formation resulting in depressed nighttime dissolved oxygen concentrations, corrosiveness to copper pipes and a measurable toxic effect to many aquatic species.

In 1973, the European Inland Fisheries Advisory Commission determined that fishes were the critical organisms for establishing instream ammonia criteria. Toxicity tests on freshwater fishes have shown that tolerance to ammonia appears to differ for various species of fishes for short periods of exposure to high concentrations. For long-term exposure, however, it is believed that sublethal concentrations of ammonia affect different fishes similarly. Studies have shown that the ultimate response to a given concentration of un-ionized ammonia is the same for trout and carp. Thus, a single criterion appears adequate for all species of freshwater fishes and other aquatic life (Ball 1967 as sited in Willingham 1976, and European Inland Advisory Commission 1973). Both the National Water Quality Laboratory and the European Inland Fisheries Advisory Commission have recommended that for freshwater aquatic life, un-ionized ammonia should not exceed 0.02 mg/ℓ NH_3-N (W. Willingham, 1976).

In aqueous solution, ammonia exists in two forms--the ionized (NH_4^+) and the un-ionized (NH_3) species. Studies have shown the un-ionized species to be the predominant toxic agent to aquatic life. Relative concentrations of the two forms are highly dependent on pH and temperature. The un-ionized fraction increases with rising pH and with rising temperature. Other parameters, such as free carbon dioxide, dissolved oxygen and bicarbonate alkalinity, which are all interactive with pH, affect the toxic effect of ammonia, though to a lesser extent than pH or temperature. To a point, increasing salinity or ionic strength tends to decrease ammonia toxicity, though this too is of lesser importance than pH or temperature.

The U.S. Environmental Protection Agency has recommended a criterion for un-ionized ammonia concentration of 0.02 mg/ℓ NH_3-N as the "safe" limit for freshwater aquatic life. In this study, this limit is used together with representative background conditions to calculate allowable discharges of ammonia from the Grand Junction and Fruita treatment facilities. Two exceptions to this criterion should be noted. In waters with temperatures less than 5°C, there is additional physiological stress on fishes which reduces their ability to resist toxic effects of ammonia (European Inland Fisheries Advisory Commission, 1973). In addition, at high pH values and very low levels of free carbon dioxide, "the levels of un-ionized ammonia found to be toxic may be about five times greater than those applicable to polluted waters where the level of free carbon dioxide is likely to be high and the pH value lower" (European Inland Fisheries Advisory Commission, 1973). In this report, pH values greater than 8.5 are considered high. Provision for these exceptions are included in the calculations and presented in the discussion of results.

OBJECTIVES

The objective of this study is to gather specific water quality data for an entire water year so that discharge requirements for the Grand Junction and Fruita wastewater treatment facilities can be established which will achieve an instream concentration of un-ionized ammonia no greater than 0.02 mg/ℓ NH_3-N. The specific water quality data measured are temperature, pH, total ammonia and flow. These data are used together with historical data to determine background concentrations of un-ionized ammonia statistically representative of the study area for each season of the year. From this determination of instream conditions, the mass loading of total ammonia from the two treatment facilities is calculated such that the concentration of un-ionized ammonia in the river will not exceed 0.02 mg/ℓ NH_3-N.

APPROACH

The monitoring program is designed to encompass one precipitation cycle, or water year, beginning in September 1978 and continuing through the end of September 1979. This provides a continuous record of water quality data which can be compared to historical data to determine how representative the 1978-79 season is of average conditions. The monitoring program consists of four components: (1) dye tracer study, (2) intensive surveys, (3) water quality sampling, and (4) flow determination. The first two components are discussed in detail in Appendices D and E. The last two components, which form the bulk of the study, are presented in Section 3.

Dye Tracer Study

The initial task of the project is to inject a bio-degradable fluorescent dye into Persigo and Little Salt washes to determine mixing patterns in the Colorado River during summer low-flow conditions. The locations of the dye injections are approximately the proposed sites for future wastewater discharge from Grand Junction and the current site for wastewater discharge from Fruita. The dissolved dye can be reasonably assumed to simulate the behavior of ammonia present in wastewater effluent, and the result in mixing characteristics can be used to predict the dilution pattern of ammonia in the river. The results of this study are used to select the exact locations of the sampling sites for the 13-month monitoring program.

Intensive Surveys

Diurnal variations of the concentration of un-ionized ammonia in the river are established by frequent water sampling throughout the course of one day at critical locations. These repeated samplings, or intensive surveys, are performed twice during the monitoring program--once each during the summer and winter low-flow periods--to look for correlations as well as to determine seasonal differences in the diurnal patterns. Results from the intensive surveys are used to adjust all un-ionized ammonia determinations made during the 13-month study period to one reference time. This time adjustment helps validate comparisons between sampling events, regardless of what time of day the sampling occurred.

Water Quality Sampling

Water quality sampling is conducted weekly for 13 months to measure pH, temperature and total ammonia concentration at ten stations along the Colorado River and its tributary washes. At the river stations, several samples are obtained along a transect, resulting in a total of 35 sampling sites. Locations of the ten stations are shown in Figure 1, and the transect points for Stations 3, 5, 7 and 10 are shown in Figures 2 and 3. The sampling stations and the reasons for their locations are described as follows:

Station 1	*Colorado River on the West Side of the Grand Avenue Bridge in Grand Junction, 0.4 km (0.2 mi) Upstream from the Existing Sewage Treatment Plant*--Six sampling points were employed across a transect beneath arches in the bridge. This station serves as the control for background conditions without any influence of the treatment plant.
Station 2	*Effluent from the Grand Junction Treatment Plant during Hours of Peak Flow (10:00 am and 2:00 pm)*--This sample provides an accurate measure of effluent quality at the time of sampling.
Station 3	*Colorado River Just Upstream of Persigo Wash, 9.5 km (5.9 mi) Downstream from Grand Junction Treatment Plant*--Three sampling points are located across a transect at 1/4, 1/2 and 3/4 points across the river. Effects from the treatment plant should be fully mixed at this distance downstream, and samples show background river conditions without effects of Persigo Wash.
Station 4	*Persigo Wash 15 to 30 Metres (45 to 90 ft) from Confluence with Colorado River, Proposed Receiving Water Course for Future Regional Treatment Plant*--One sample taken at the center of the stream represents the quality of agricultural runoff as well as background quality of receiving water.

FIGURE 2

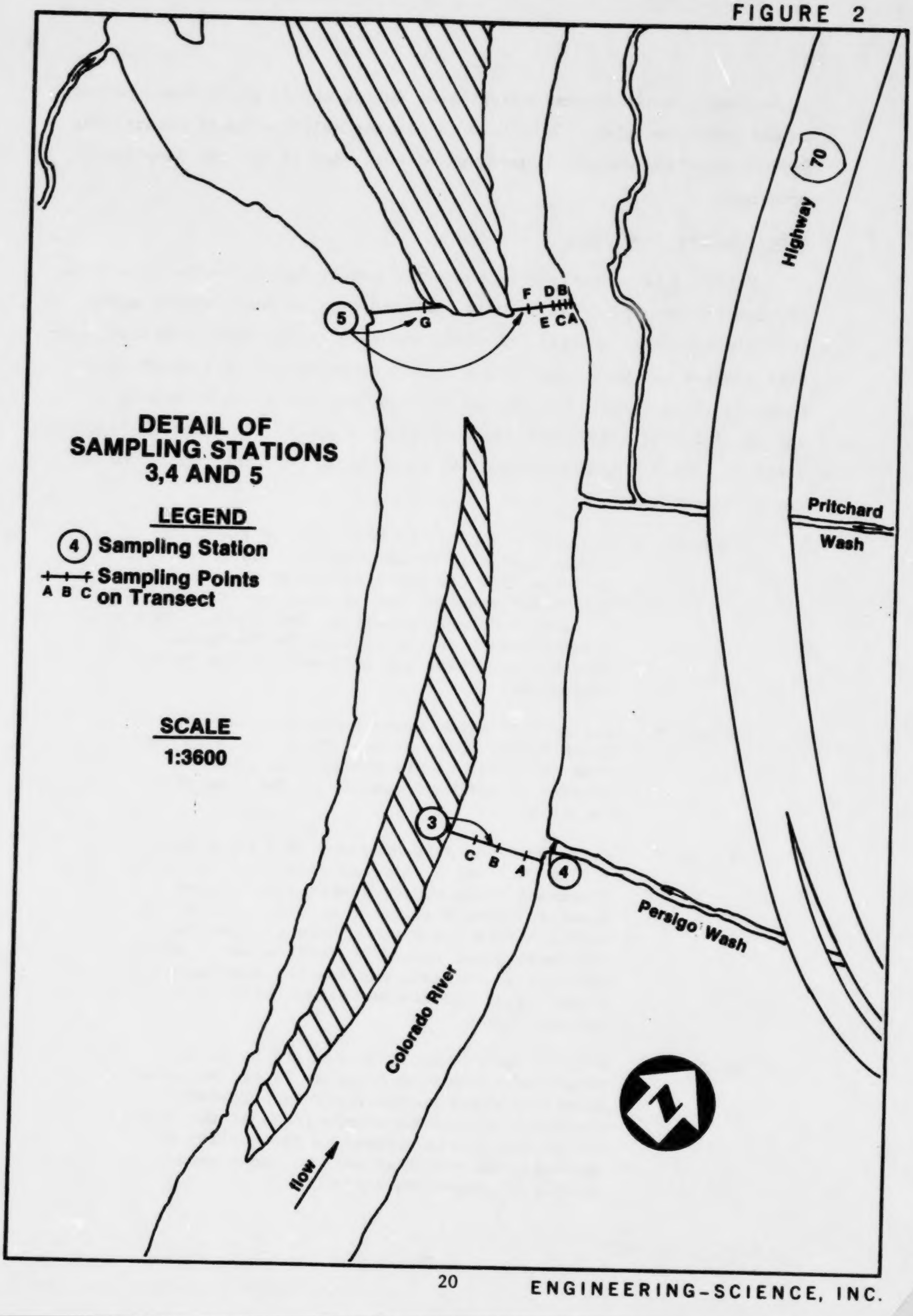
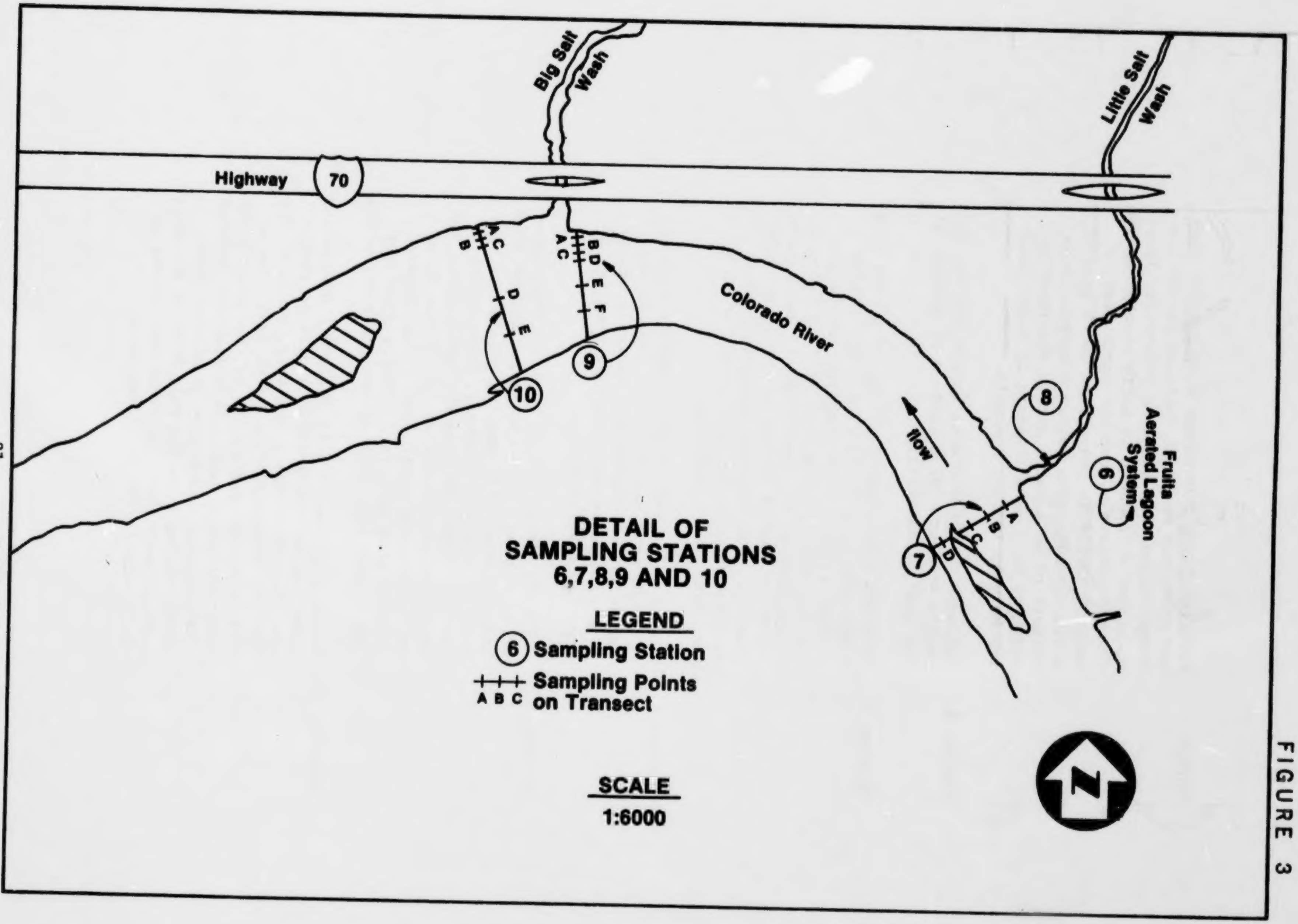

DETAIL OF SAMPLING STATIONS 3,4 AND 5
LEGEND
4 Sampling Station
A B C Sampling Points on Transect
SCALE
1:3600
5
G
F D B
E C A
3
C B A
4
Highway 70
Pritchard Wash
Persigo Wash
Colorado River
flow
N

FIGURE 3



DETAIL OF SAMPLING STATIONS 6,7,8,9 AND 10

Big Salt Wash
Little Salt Wash
Highway 70
Colorado River
flow
Fruita Aerated Lagoon System
6
7
8
9
10
A
B
C
D
E
F
LEGEND
6 Sampling Station
A B C Sampling Points on Transect
SCALE
1:6000
N

Station 5	*Colorado River Downstream from Persigo Wash and Pritchard Wash, at Upstream End of Mid-River Island*--Six sampling points are located across a transect in north channel at 3-m (10-ft) intervals from the north bank; a seventh sample is taken from north side of south channel. The transect samples show effects of wash water across the river width as well as difference in water quality between the two channels.
Station 6	*Effluent from the Fruita Lagoon System*--This sample will provide a measure of quality at the time of sampling.
Station 7	*Colorado River Just Upstream of Little Salt Wash (Receiving Water Course for Fruita Lagoon System)*--Four sampling points are located across a transect at 1/4, 1/2 and 3/4 points on the east channel, and a fifth point is located in the center of the west channel. Samples show background river conditions without the effects of Little Salt Wash and Fruita discharges.
Station 8	*Little Salt Wash, About 50 Metres (150 ft) Upstream from the Discharge from Fruita Lagoon System*--One sample taken at center of stream represents the background quality of receiving water.
Station 9	*Colorado River, 0.8 km (0.5 mi) Downstream of Little Salt Wash and Just Upstream from Big Salt Wash*--Six smpling points are located across a transect, four at 3-m (10-ft) intervals from the north bank, one at mid-river and one at 3/4 of the river width from the north bank. The transect samples show effects of Fruita discharge and Little Salt Wash across the river width.
Station 10	*Colorado River, 0.2 km (0.12 mi) Downstream from Big Salt Wash*--Five samplings points are located across a transect, three at 3-m (10 ft) intervals from north bank, one at mid-river and one at 3/4 of the river width from the north bank. This station, located the farthest downstream of all stations, is where mixing from Big Salt Wash is occurring, and effluent from the treatment plants is fully mixed with the river water.

During the regular monitoring program, sampling is conducted on Monday afternoon of each week, whenever possible. During the two intensive surveys, the regular weekly sampling at Stations 3, 4, 5, 7, 8 and 9 is suspended to avoid duplication. For two months during the summer, August and September, sampling frequency increases to twice per week to provide more data during the critical low-flow period.

Flow Determination

Streamflow is determined by measuring stream velocity and cross-section area at two river sites and two tributary sites monthly. The sites include the Broadway Bridge (also referred to as Grand Avenue Bridge) across the Colorado River at Grand Junction, Station 1, and the State Highway 340 Bridge across the Colorado River near Fruita, 1.7 km (1 mi) upstream of Station 7. Persigo Wash, Station 4, is gauged at a site downstream of Interstate 70, and Little Salt Wash, Station 8, is gauged at a site under the Highway 6 Bridge. In addition, flows from the two treatment facilities, Stations 2 and 6, are measured using existing gauges.

SECTION 3

MONITORING PROGRAM: METHODS, RESULTS AND DISCUSSION

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SECTION 3

MONITORING PROGRAM: METHODS, RESULTS AND DISCUSSION

METHODS OF WATER SAMPLE COLLECTION AND ANALYSIS

Sample Collection

Water samples were collected by submerging and filling plastic sample bottles, about 30 cm (1 ft) below the surface of the water. Clean sample bottles were rinsed several times with river water before filling to minimize contamination. Care was taken to avoid collecting any debris floating in the water.

At most sampling sites, the river was shallow enough to allow sample collection by wading. For these stations, the sampling point could be accurately relocated by pacing between points. Sites sampled by wading included Stations 1A through 1F, 2, 4, 5A through 5G, 6, 7D, 8, and 10A through 10C. All other sampling sites required access by boat. These were Stations 3A through 3C, 7A through 7C, 9A through 9F and 10D through 10E. For these sites, the length of the boat was used to measure distance between sampling points. Samples were collected from the forward part of the boat to prevent contamination from the motor. The type of boat employed was a 10-ft fiberglas, twin-hull fishing boat powered by a 10 HP outboard motor.

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Sample Analysis

Temperature

Thermometers, calibrated biannually with a National Bureau of Standards Certified Thermometer, were placed in plastic protective casings to avoid breakage. Temperature readings were made immediately following collection of individual samples, either while wading or from the boat. After allowing time for the thermometers to equilibrate, readings were made to the nearest 0.1°C.

pH

Each week, immediately following collection of all samples, pH values were measured using a Weston and Stack portable pH meter. The meter was calibrated with standard buffer solutions of pH 7.00 and 10.00 which were thermally equilibrated with the samples. Calibration with the buffer solution was repeated several times during each set of measurements to check for any drift in the meter. Readings were taken to the nearest 0.1 pH unit.

Ammonia-Nitrogen

For all river and wash samples, concentration of ammonia was determined using the direct nesslerization method; effluent samples were analyzed using distillation followed by nesslerization to ensure accurate measurements at higher ammonia concentrations.

After the pH determination, samples were acidified with sulfuric acid and, when possible, refrigerated until analyzed for ammonia. It was originally planned to analyze the samples in the field using a Bausch and Lomb m-spec 20 spectrophotometer. However, the quality of distilled water available in the field was highly variable and produced inconsistencies in recovery rates and spiked and duplicate samples. Consequently, most of the samples were analyzed in the Engineering-Science Research and Development Laboratory.

Ammonia analyses were conducted according to procedures in Standard Method 418B. To ensure the reliability of the results, three recovery analyses were performed with each set of samples. The recoveries were done over a wide range of concentrations--12.2, 36.6, 61.0 μg--

so that the most accurate value of precision may be determined. Occasionally a sample was analyzed in duplicate, again to demonstrate the precision of the analysis. When the sample volume of 50 mℓ exceeded the range of the standards, the sample was diluted to 2 mℓ in 50 mℓ. Recovery rates generally ranged between 95 and 105 percent.

Due to the nature of the water samples, a high turbidity was often encountered. To remove extraneous particles, $ZnSO_4$ was used as a flocculating agent. As the samples were preserved with dilute acid, 4 mℓ of 6N NaOH had to be added before the precipitation process would occur. The samples were then filtered, and 50 mℓ of filtrate retained for analysis. Depending on the turbidity of the water, numerous filtrations were often required.

The greatest source of error was undetected colloidal particles which would increase the apparent NH_3 value when measurements were made on the spectrophotometer. To avoid this, the sample concentrations for about 10 percent of the samples were determined using nessler tubes instead of the spectrophotometer.

RESULTS OF WATER QUALITY SAMPLING

Water quality sampling began on 8 September 1978 and continued thereafter on a weekly basis until 29 September 1979. Collected data are presented chronologically in Appendix A. Time of sampling, measured temperature, pH and concentration of total ammonia are given together with calculated concentrations of un-ionized ammonia and time-adjusted un-ionized ammonia. Missing data are due to one of two reasons: (1) sample was lost or damaged in transit; or (2) sampling point was not accessible because of legal problems, mud, ice, or boat failure.

Un-ionized ammonia concentrations in the river exceeding the recommended EPA criterion of 0.02 mg/ℓ NH_3-N are denoted with asterisks--one asterisk for samples with pH greater than 8.5 (to indicate situations of less potential toxicity) and two asterisks for samples with pH less than 8.5. This distinction is noted because at pH greater than 8.5, if there is little free carbon dioxide in the water, the tolerance of fishes to un-ionized ammmonia appears to increase (Eur. Inland Fisheries Adv. Comm., 1973).

Calculations of un-ionized ammonia concentration are based on the relationship described in Ammonia Toxicity by Willingham. In solution, un-ionized ammonia exists in equilibrium with ionized ammonia and the hydroxide ion as follows:

$$NH_{3(g)} + nH_2O_{(\ell)} \rightleftharpoons NH_3 \cdot nH_2O_{(aq)} \rightleftharpoons NH_4^+ + OH^- + (n-1)H_2O_{(\ell)}$$

The relative concentrations of the two forms of ammonia are determined by the following relationship:

$$K_a = K_w \frac{\text{(Conc. un-ionized ammonia)}}{\text{(Conc. ionized ammonia)(Conc. hydroxide ion)}}$$

where K_a and K_w are constants dependent on temperature. The concentration of un-ionized ammonia is then computed from the following formula:

$$\text{(Conc. un-ionized ammonia)} = \frac{\text{(Conc. total ammonia)}}{1 + \text{antilog } (pK_a - pH)}$$

Thus, only temperature, pH and total ammonia figure in the calculations of un-ionized ammonia concentration. Other factors, such as ionic strength and paired ion species are considered minor and assumed negligible in the calculation. The activity coefficient is assumed to be 1.0 in all calculations. One exception to the use of this formula is at temperatures less than 5.0°C, un-ionized ammonia is calculated at 5.0°C rather than at the actual temperature. This is because of the additional stress to fishes induced by lower temperatures (European Inland Fisheries Advisory Commission, 1973).

Time adjusted un-ionized ammonia concentration is determined on the basis of the diurnal trend in temperature observed during the winter intensive survey as well as during the weekly sampling. Measured temperatures were adjusted to the worst-case time of day, usually about 3 p.m.; measure pH and total ammonia, which showed no specific trends, were unchanged. Concentrations of un-ionized ammonia were then calculated using the adjusted temperature, measured total ammonia and measured pH. All calculations were performed on the Engineering-Science digital computer.

DISCUSSION OF WATER QUALITY RESULTS

Spatial Correlation of Un-Ionized Ammonia

River Width

Relative data for all transect points of the river stations were examined for predominating effects caused by proximity to the banks, such as depth of water, sediments or runoff. In nearly all cases, pH and temperature remained consistent for all transects. As expected, the temperature at sampling points closer to the banks, where the river is more shallow, is warmer in the summer and cooler in the winter than at points closer to mid-river. Values of pH across a transect are usually constant and vary, if at all, by only a few tenths of a pH unit.

Concentrations of total and un-ionized ammonia, on the other hand, show no apparent correlation with distance from the river banks. For any transect, the location of the highest ammonia concentration varies erratically from week to week, sometimes occuring next to the bank and at other times occuring in mid-stream. This random distribution of ammonia indicates the absence of any point sources within the study area or immediately upstream. Apparently, neither Persigo Wash nor Little Salt Wash exert an influence on the ammonia concentration of downstream sampling points. Similarly, mid-river islands exert little direct effect on ammonia levels.

Because of this lack of correlation, all sampling points on one transect for one sampling event were treated as replicates. Thus, the range of un-ionized ammonia concentrations was plotted for each station, and the median concentration* was used to represent most accurately the data for that transect.

River Distance

Un-ionized ammonia concentrations are correlated with river distance by using Station 1 (Grand Avenue Bridge) as a reference point. Concentrations of un-ionized ammonia at downstream stations are then plotted as a function of river distance from Station 1 for each month of the study. These relationships, depicted in Figures 4 through 16, are determined for the six river stations by the range and median values of un-ionized ammonia concentrations of all sampling events in each month.

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*Median, rather than mean concentration, is used because the data from any given sampling event are not necessarily normally distributed.

In general, un-ionized ammonia concentrations remained fairly constant along the 20-km reach of the river throughout the course of the study. With the exceptions of September and October 1978, un-ionized ammonia concentration varied by less than 0.003 mg/ℓ among the stations. During the spring months of April, May and June 1979, NH_3-N was most notably constant along the river. During September and October of 1978, not only a decreasing trend in un-ionized ammonia concentrations was observed from upstream to downstream stations but also the highest median values of NH_3-N in the entire study period occured. During September 1978, median values of un-ionized ammonia concentration exceeded the 0.02 mg/ℓ criterion at Stations 1, 3 and 7 and indicated a significant diluting effect by the washes immediately downstream.

Effects of increased ammonia concentrations from the wastewater discharges at Grand Junction and Fruita are not apparent in the river profiles of un-ionized ammonia levels. The only dramatic increases, observed only a few times during the study period, appear to be due to inflow from Persigo and Big Salt washes.

Temporal Correlations of Un-Ionized Ammonia

Weekly fluctuations in un-ionized ammonia concentration were plotted for the study period using the range and median values at transect points for the river stations and the single values for the washes and wastewater discharges. Figures 17 through 26 show these fluctuations for the ten sampling stations. Tremendous variation from week to week is evident in the river and wash samples, with frequent ten-fold and occasional fifty-fold changes occuring from one sampling event to another.

A seasonal trend is evident for the six river stations, despite the weekly fluctuations. In general, the high levels of un-ionized ammonia, approaching 0.01 mg/ℓ, appear to occur during late August and early September, and the low levels, about 0.001 mg/ℓ, in June and early July. Not surprisingly, these trends corresponded respectively with the lowest and highest flows in the river. Following this generalized trend, a secondary "peak" in un-ionized ammonia concentrations, about 0.05 mg/ℓ,

FIGURE 4

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING SEPTEMBER 1978

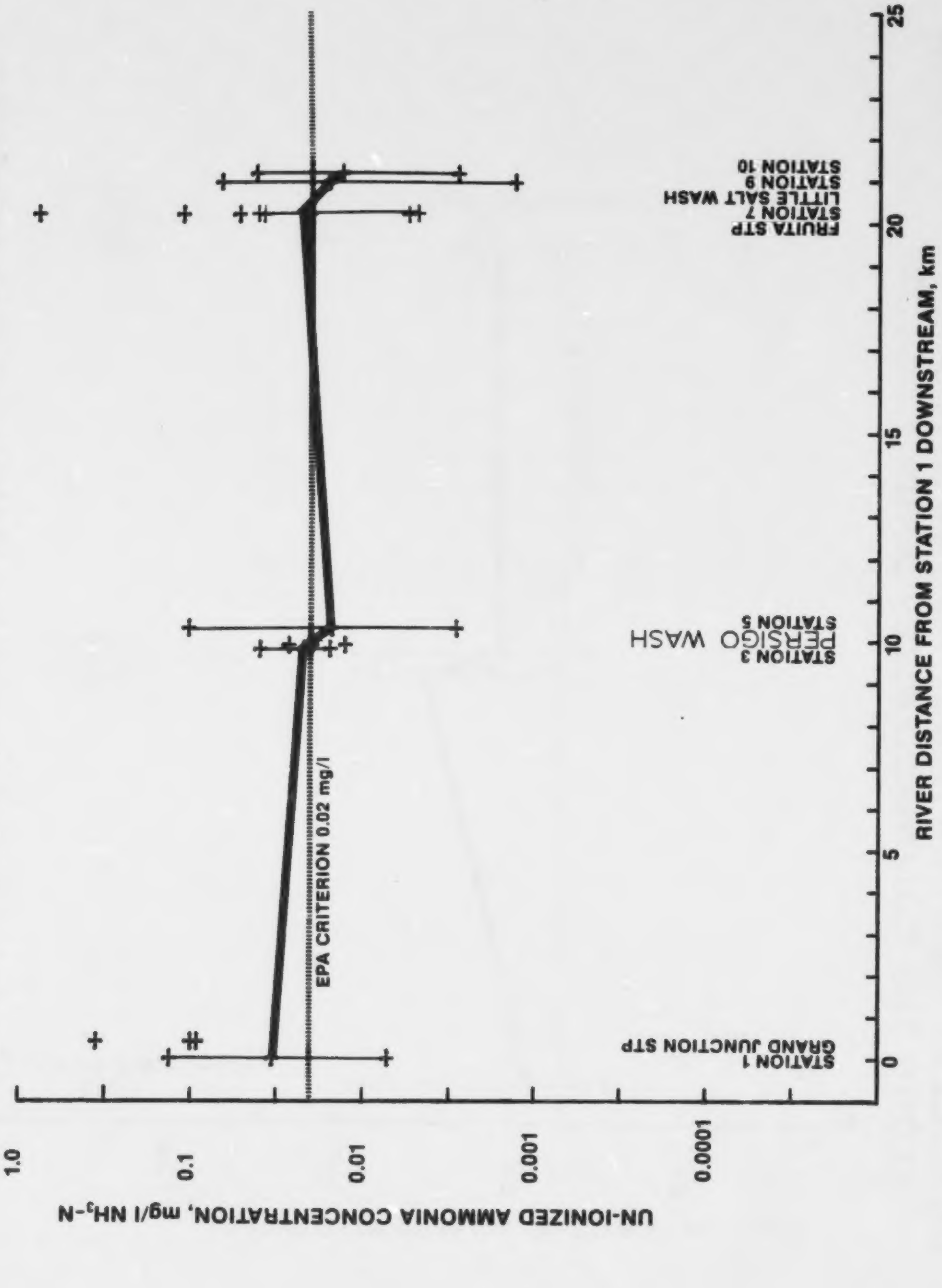
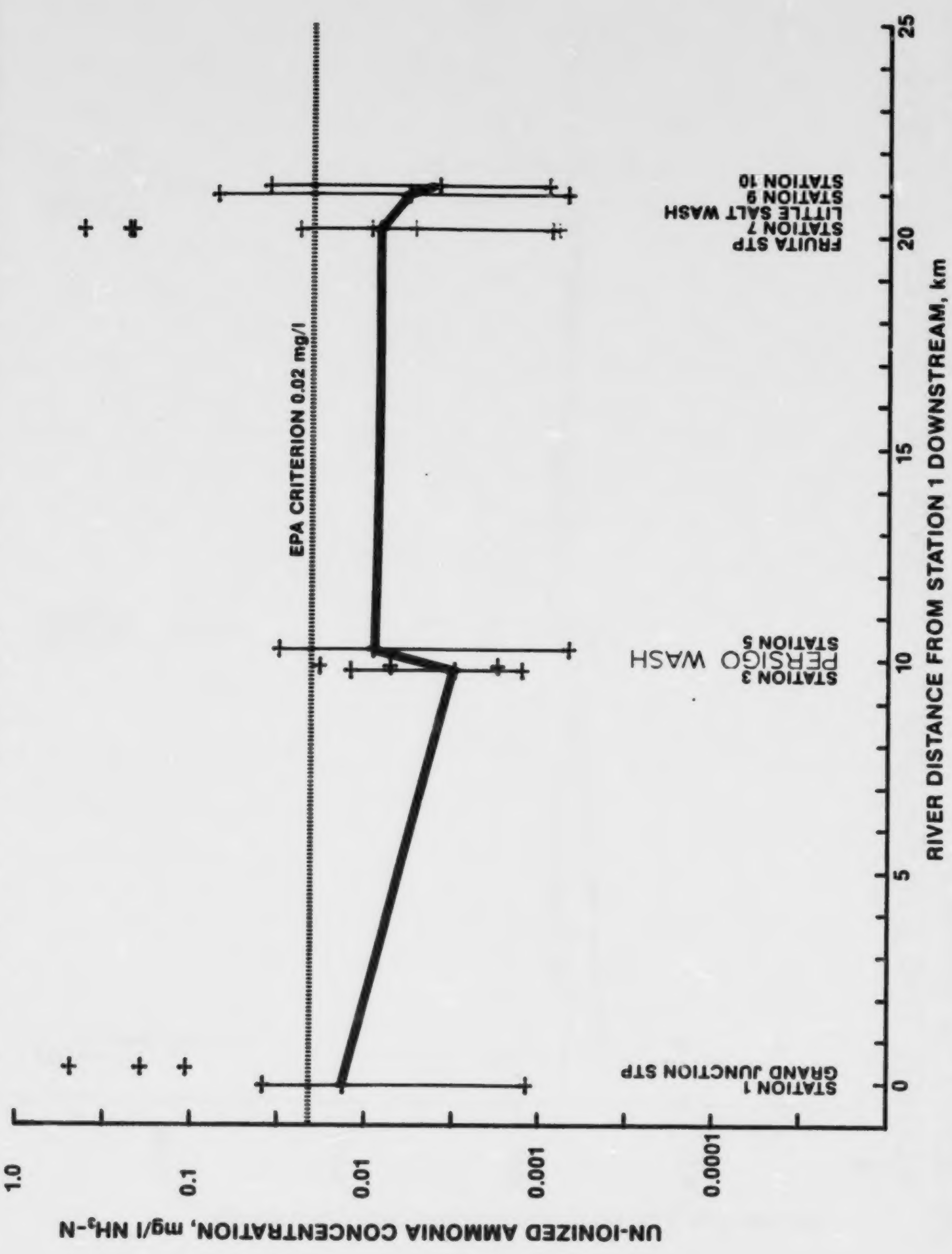


FIGURE 5

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING OCTOBER 1978



UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING NOVEMBER 1978

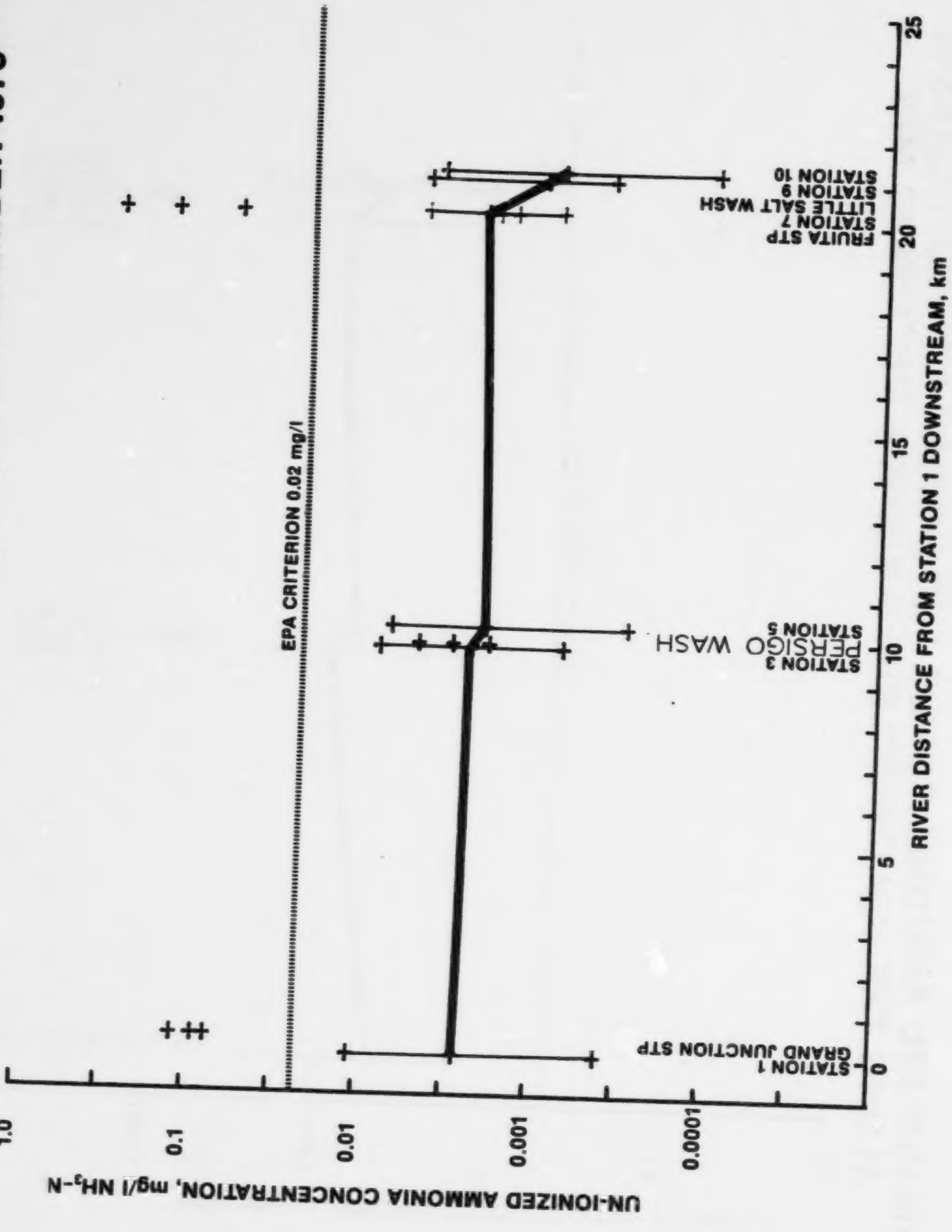


FIGURE 7

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING DECEMBER 1978

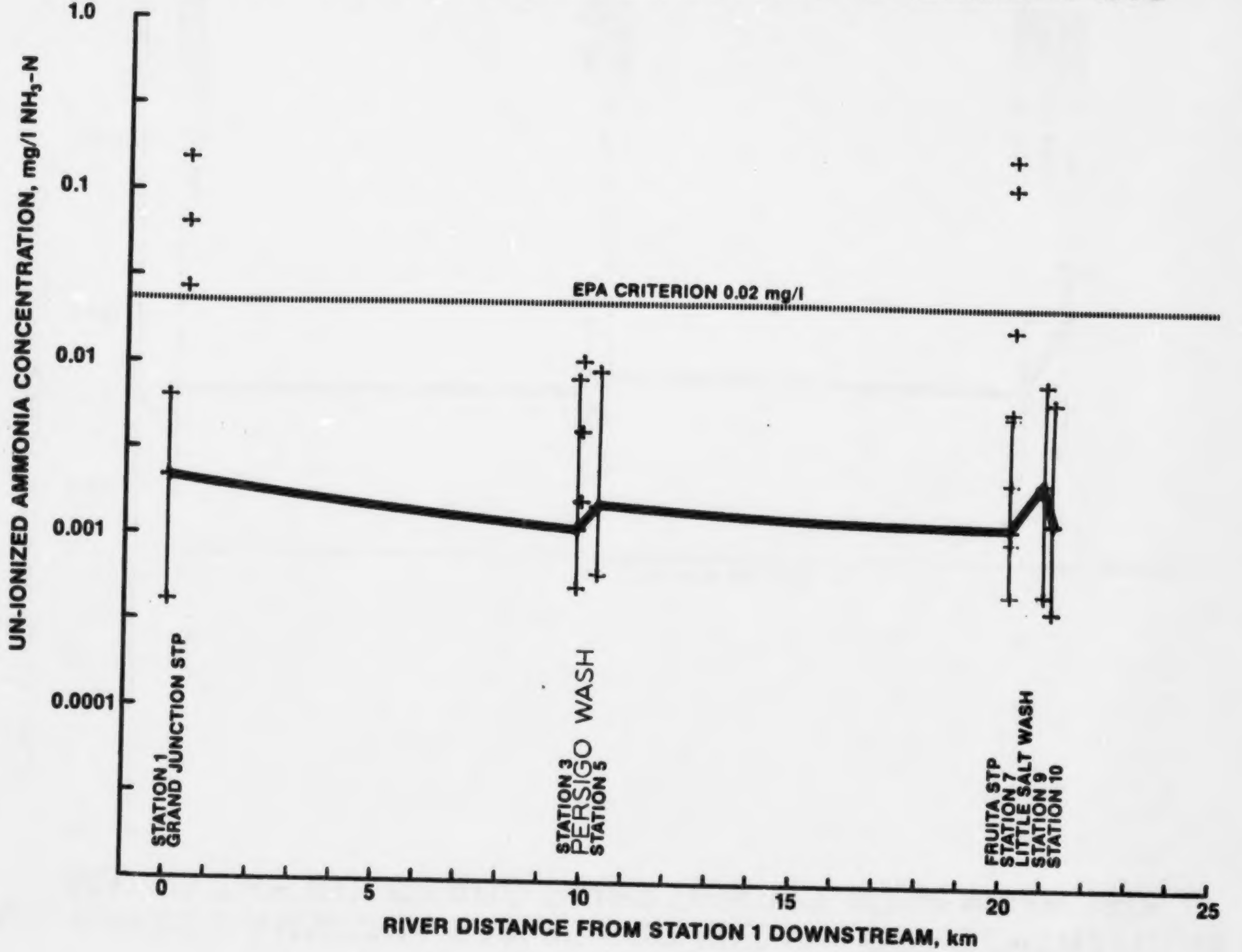


FIGURE 8

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING JANUARY 1979

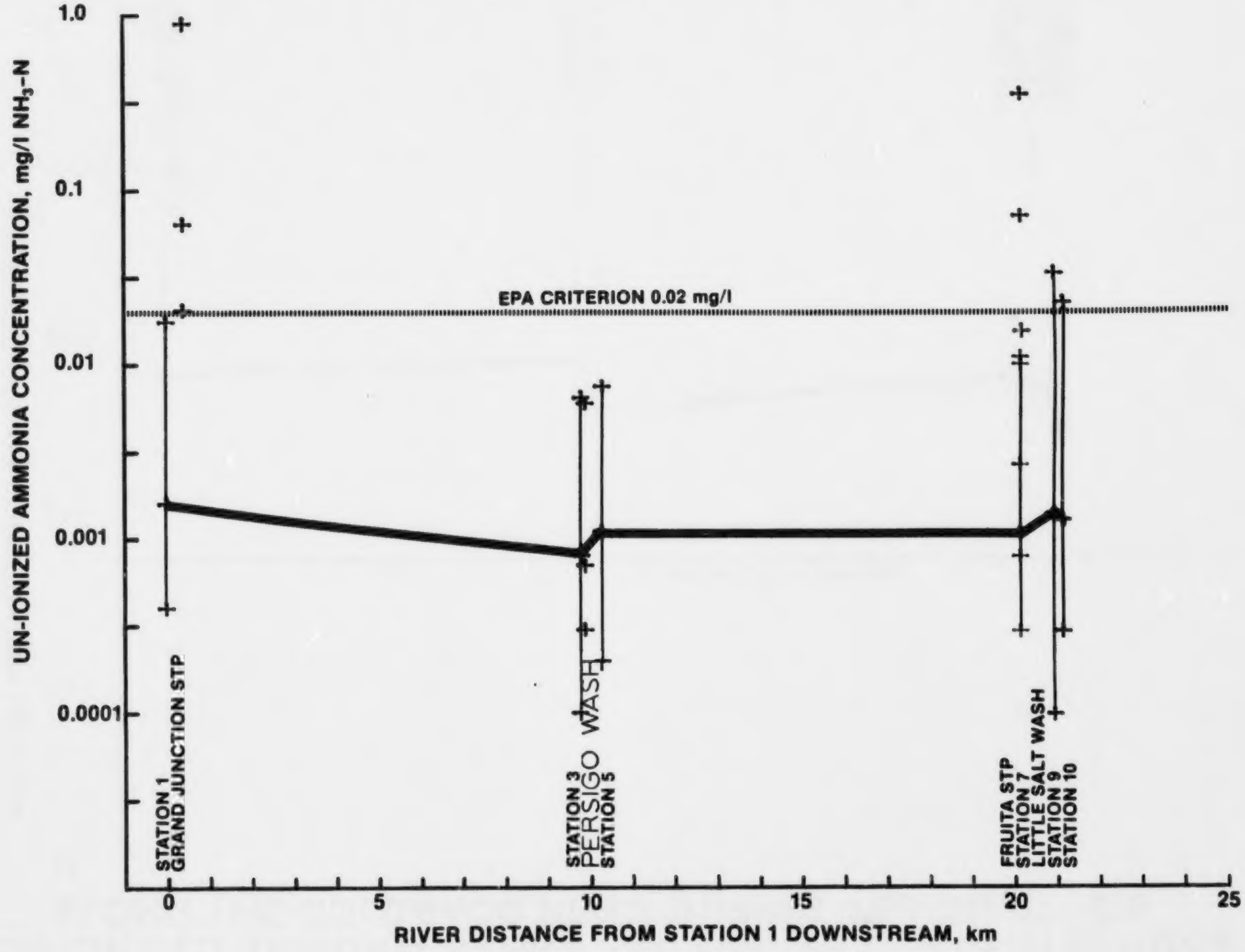


FIGURE 9

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING FEBRUARY 1979

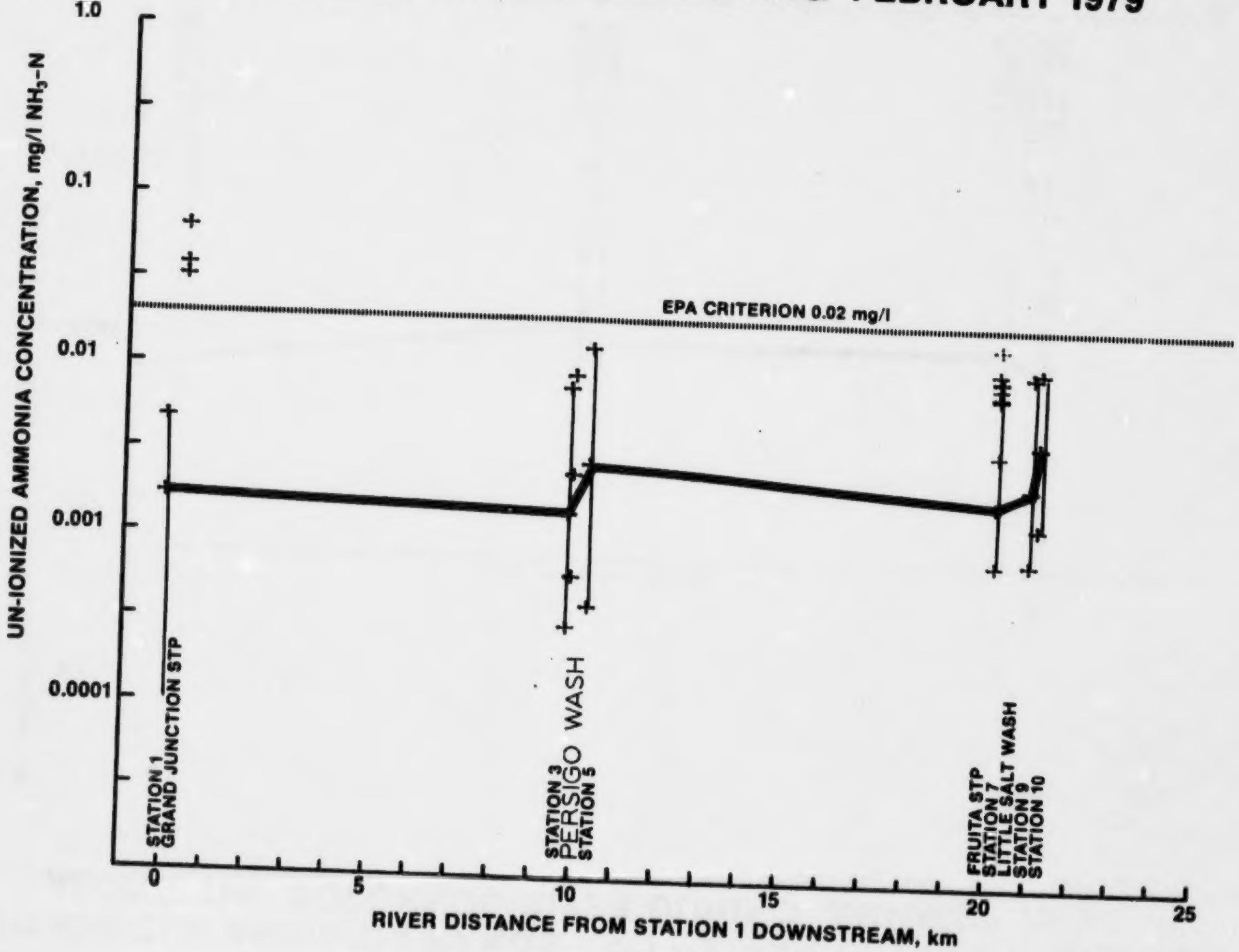
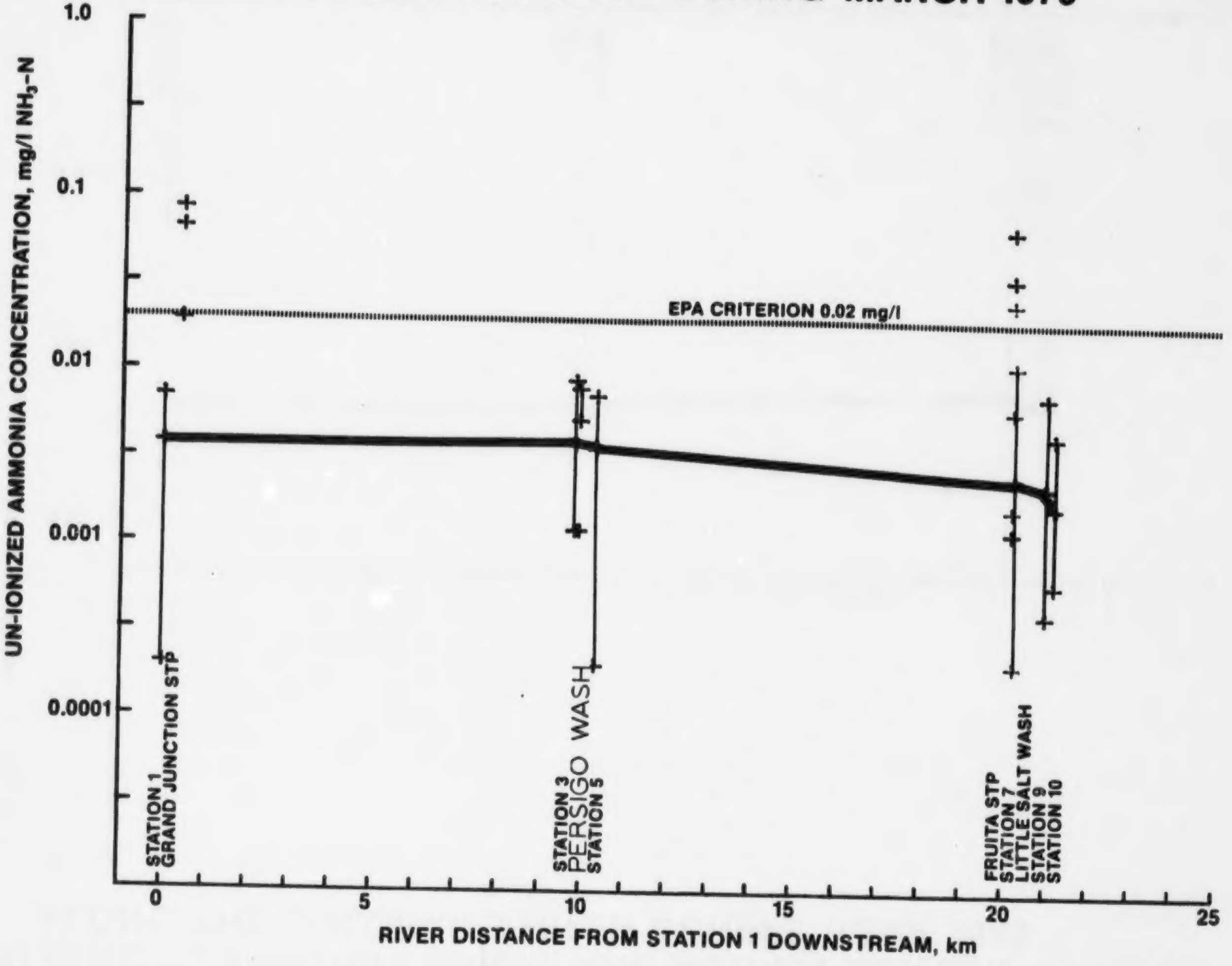


FIGURE 10

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING MARCH 1979



UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING APRIL 1979

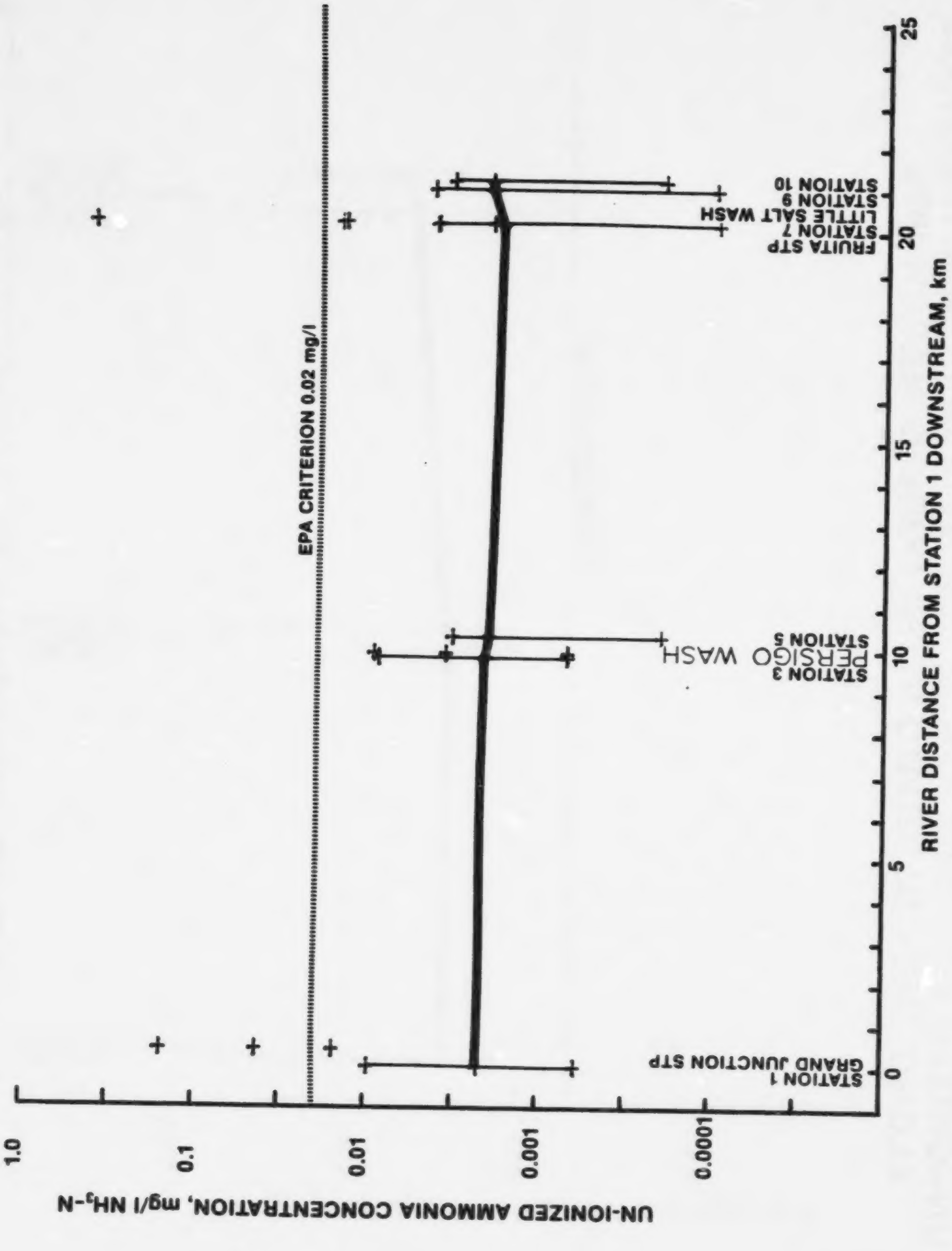


FIGURE 12

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING MAY 1979

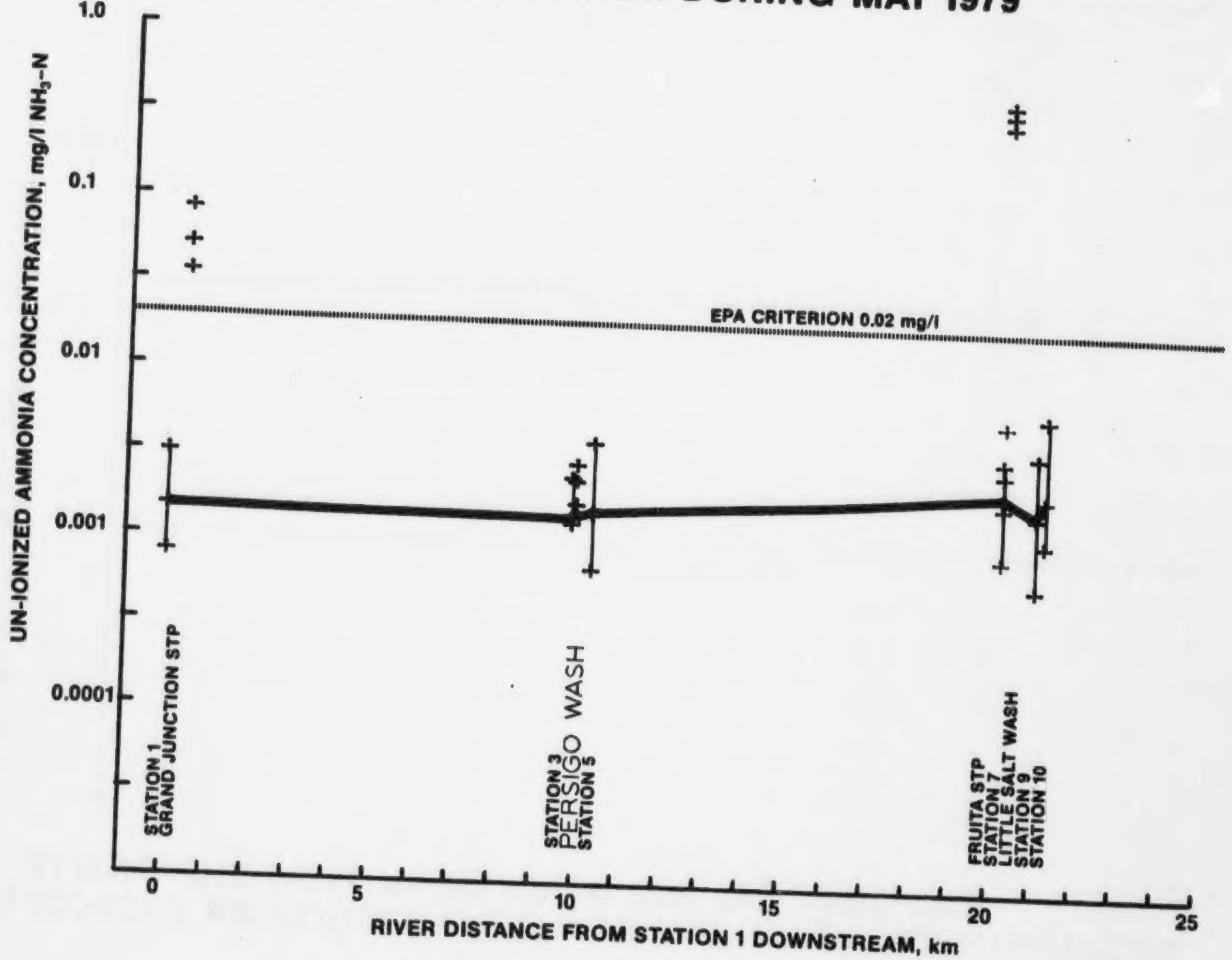


FIGURE 13

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING JUNE 1979

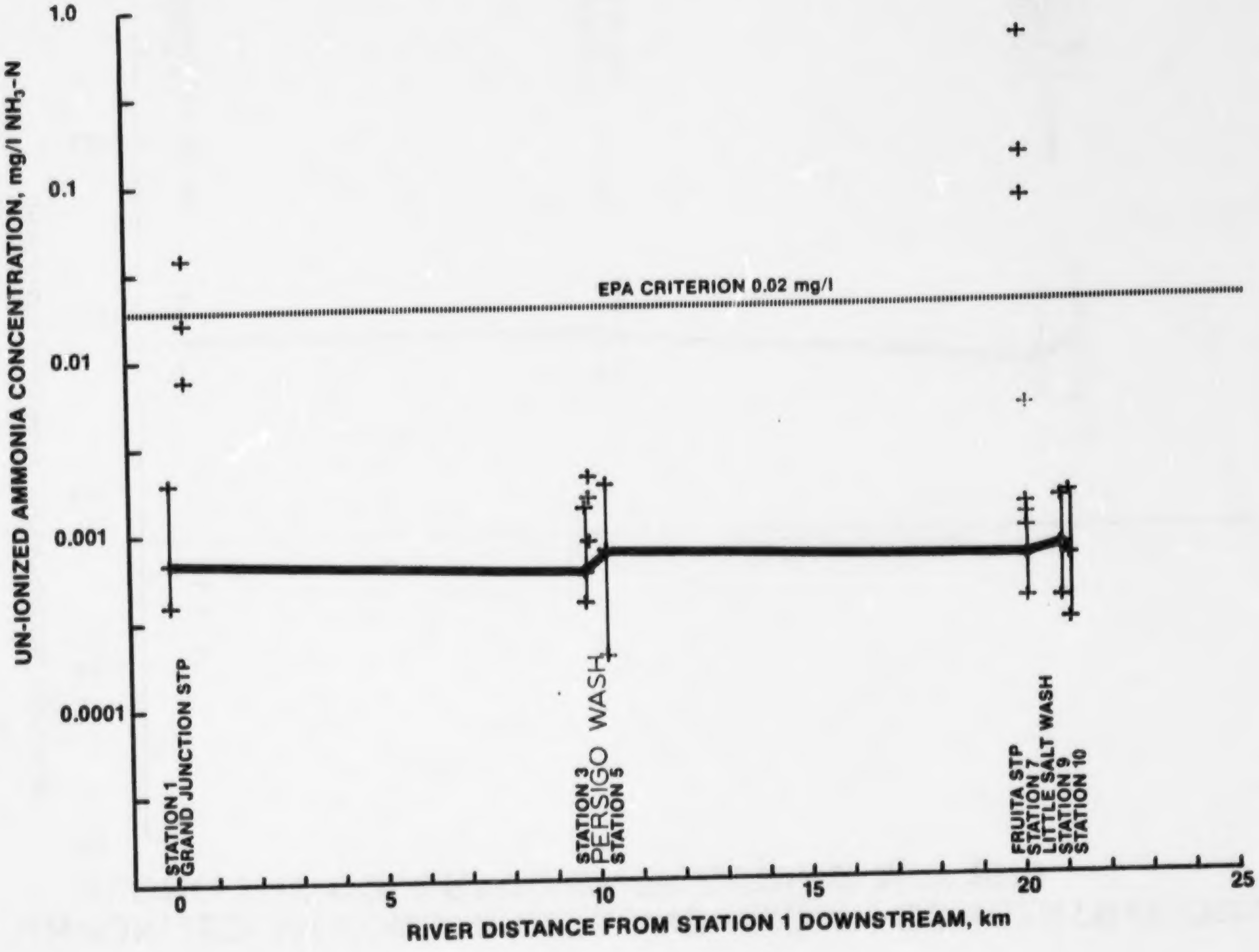


FIGURE 14

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING JULY 1979

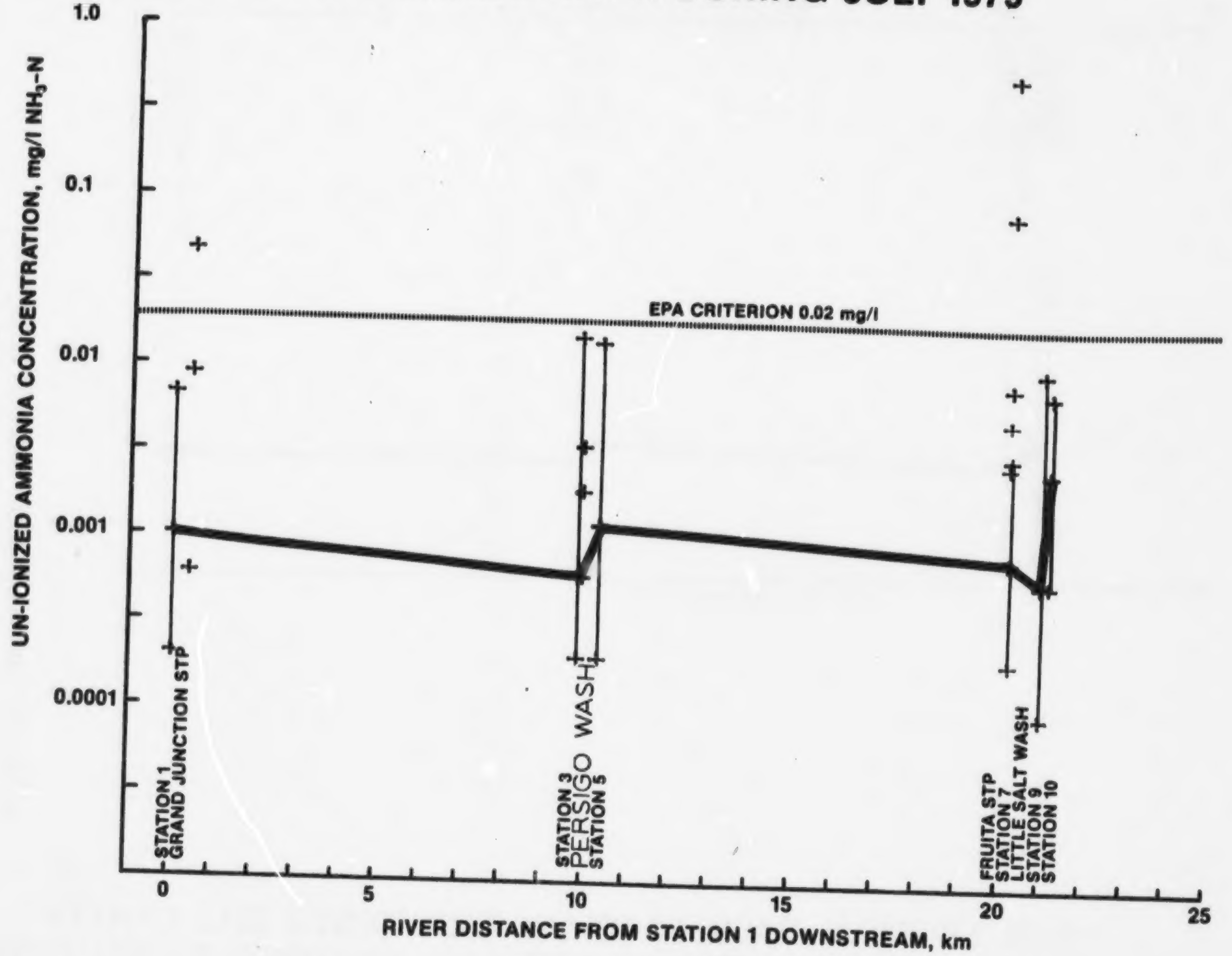


FIGURE 15

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING AUGUST 1979

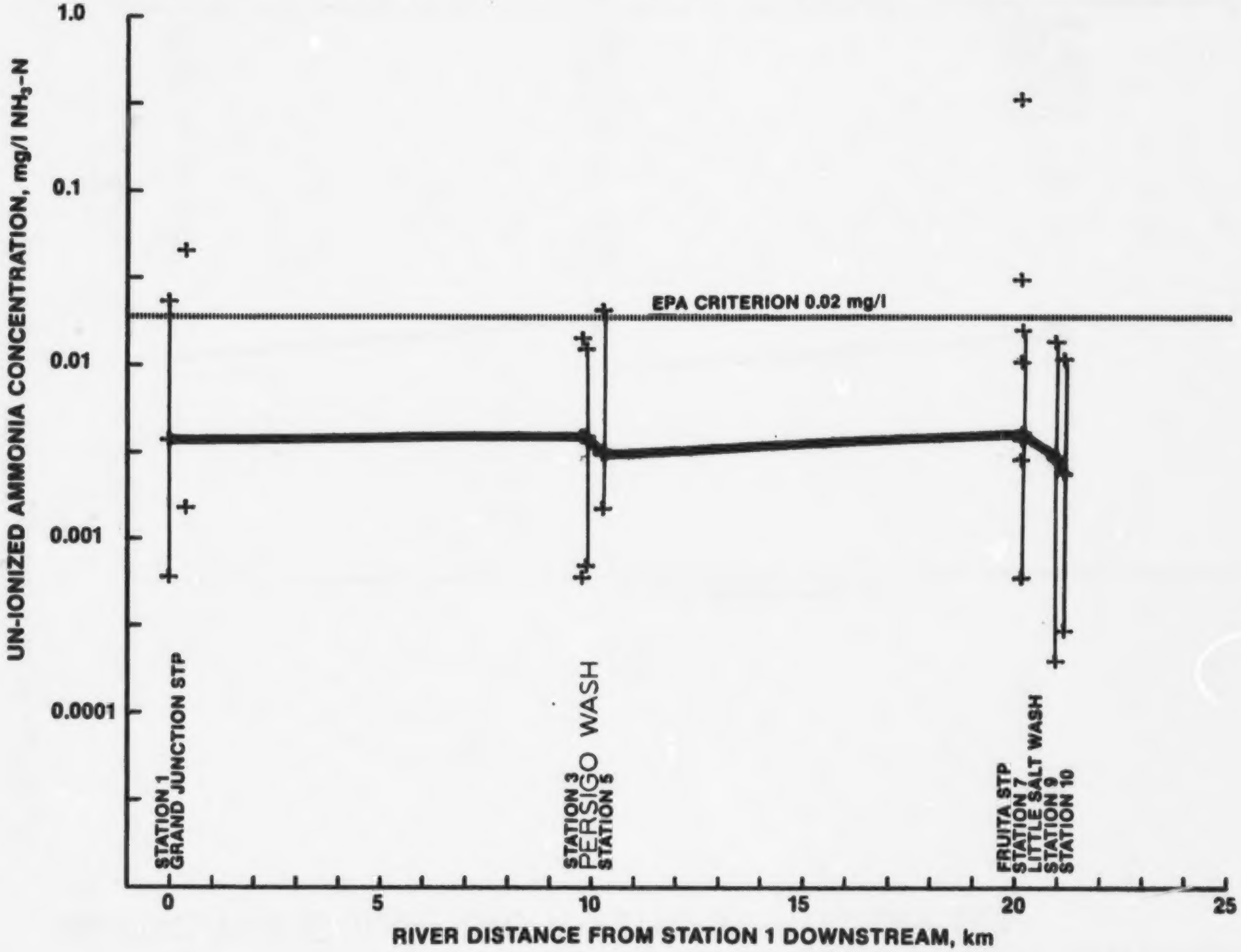


FIGURE 16

UN-IONIZED AMMONIA RANGE AND MEDIAN CONCENTRATIONS ALONG THE COLORADO RIVER DURING SEPTEMBER 1979

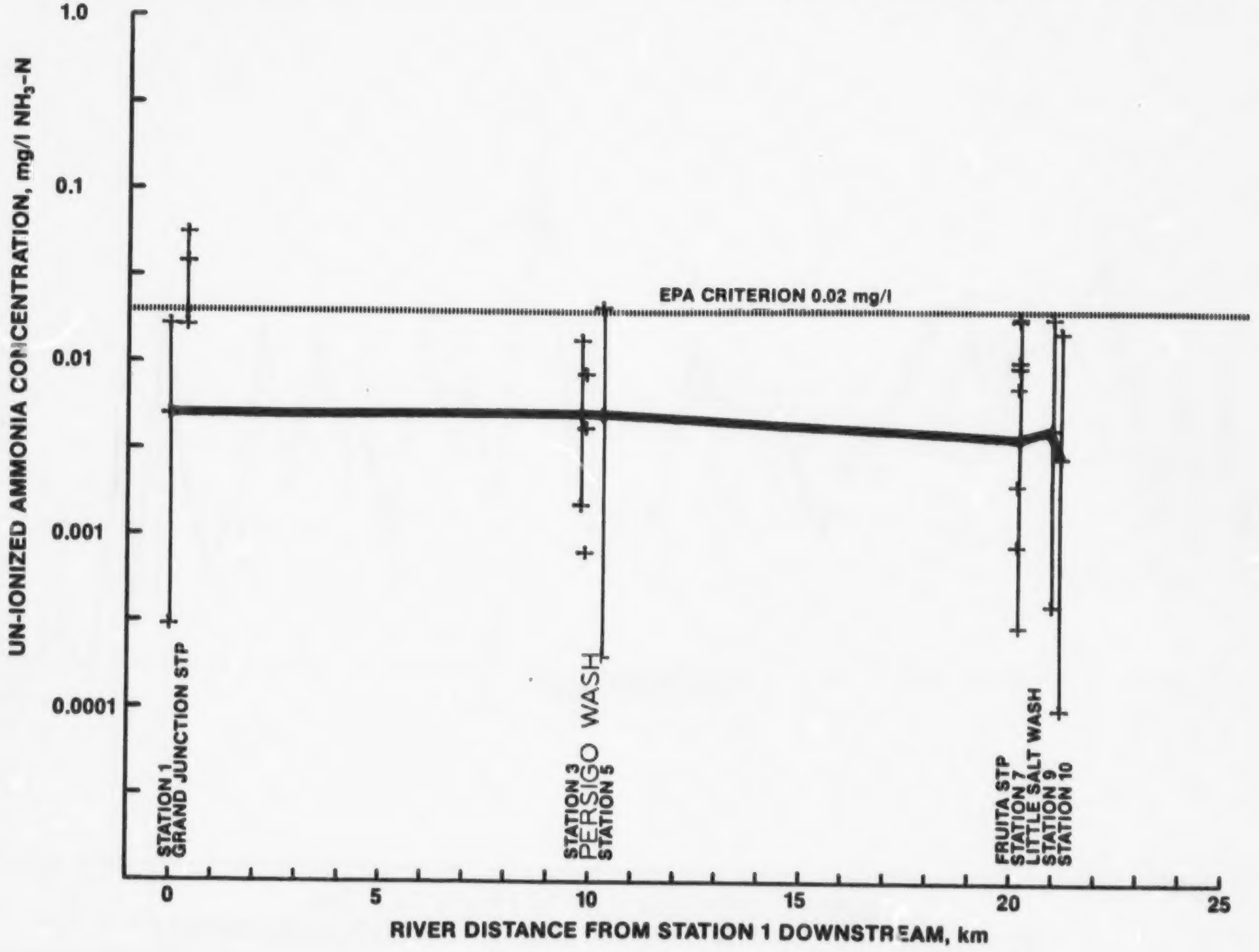
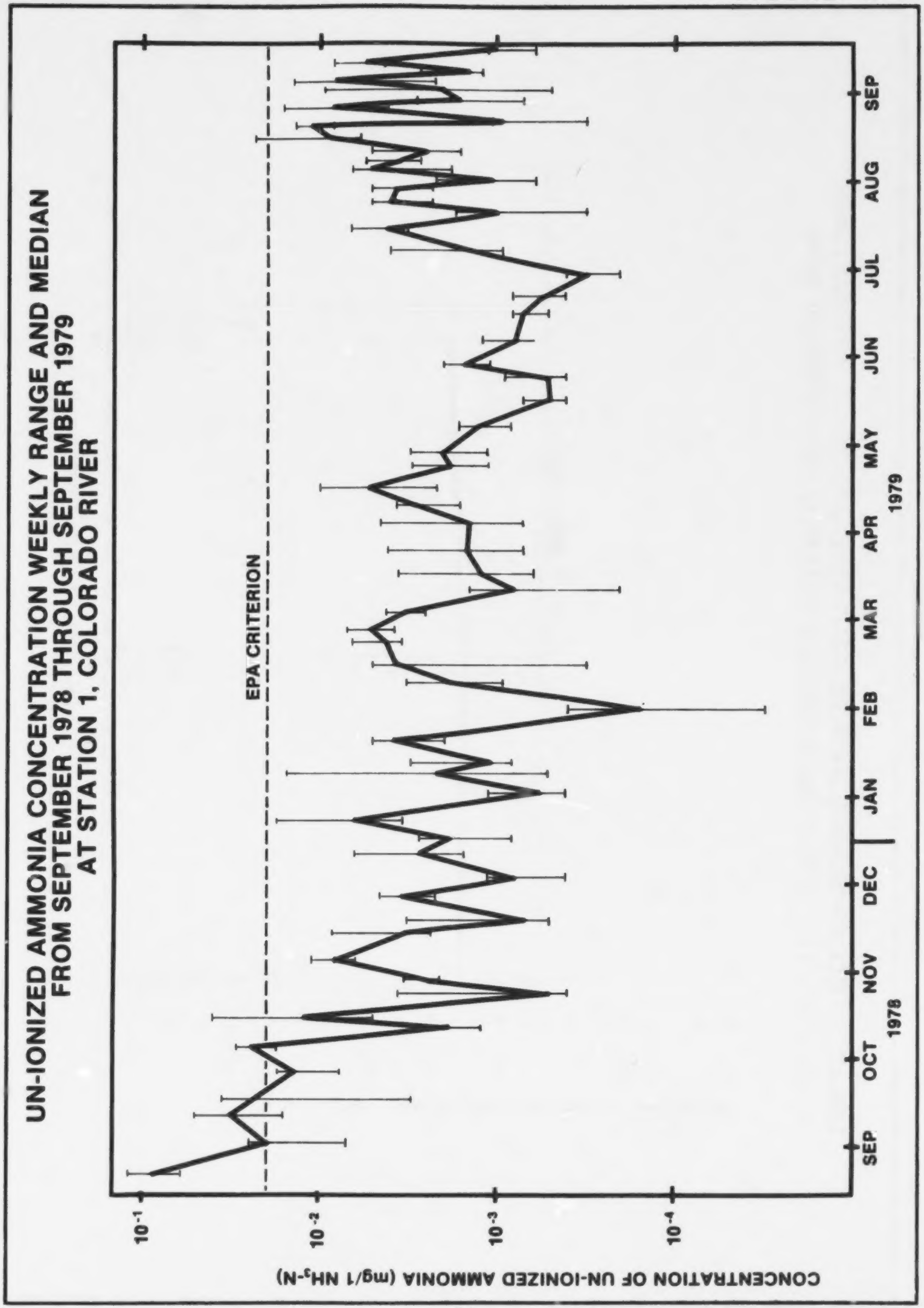


FIGURE 17



UN-IONIZED AMMONIA CONCENTRATION WEEKLY RANGE AND MEDIAN FROM SEPTEMBER 1978 THROUGH SEPTEMBER 1979 AT STATION 1, COLORADO RIVER

FIGURE 18

UN-IONIZED AMMONIA CONCENTRATION
FROM SEPTEMBER 1978 THROUGH SEPTEMBER 1979
AT STATION 2, GRAND JUNCTION SEWAGE EFFLUENT

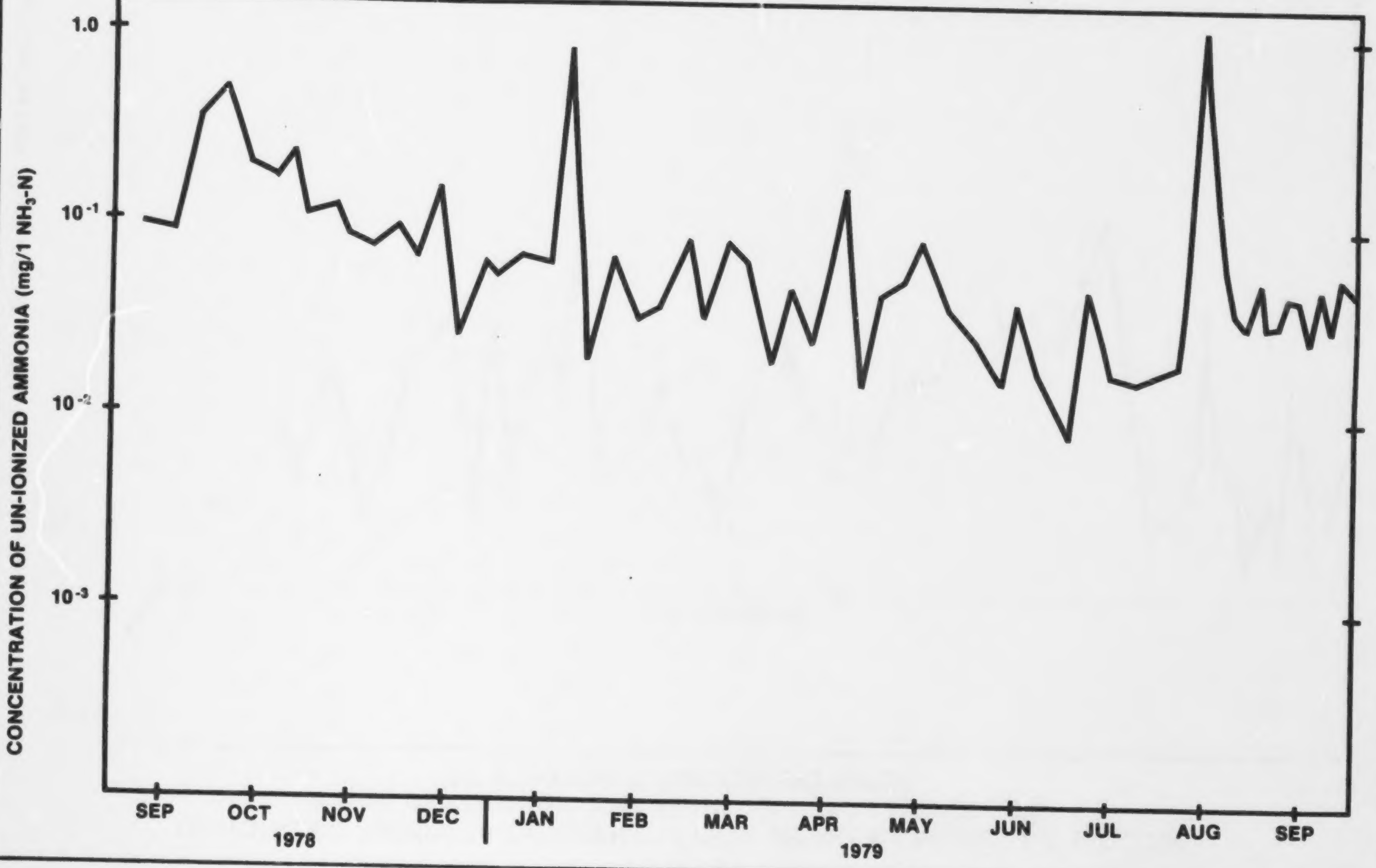


FIGURE 19

UN-IONIZED AMMONIA CONCENTRATION WEEKLY RANGE AND MEDIAN FROM SEPTEMBER 1978 THROUGH SEPTEMBER 1979 AT STATION 3, COLORADO RIVER

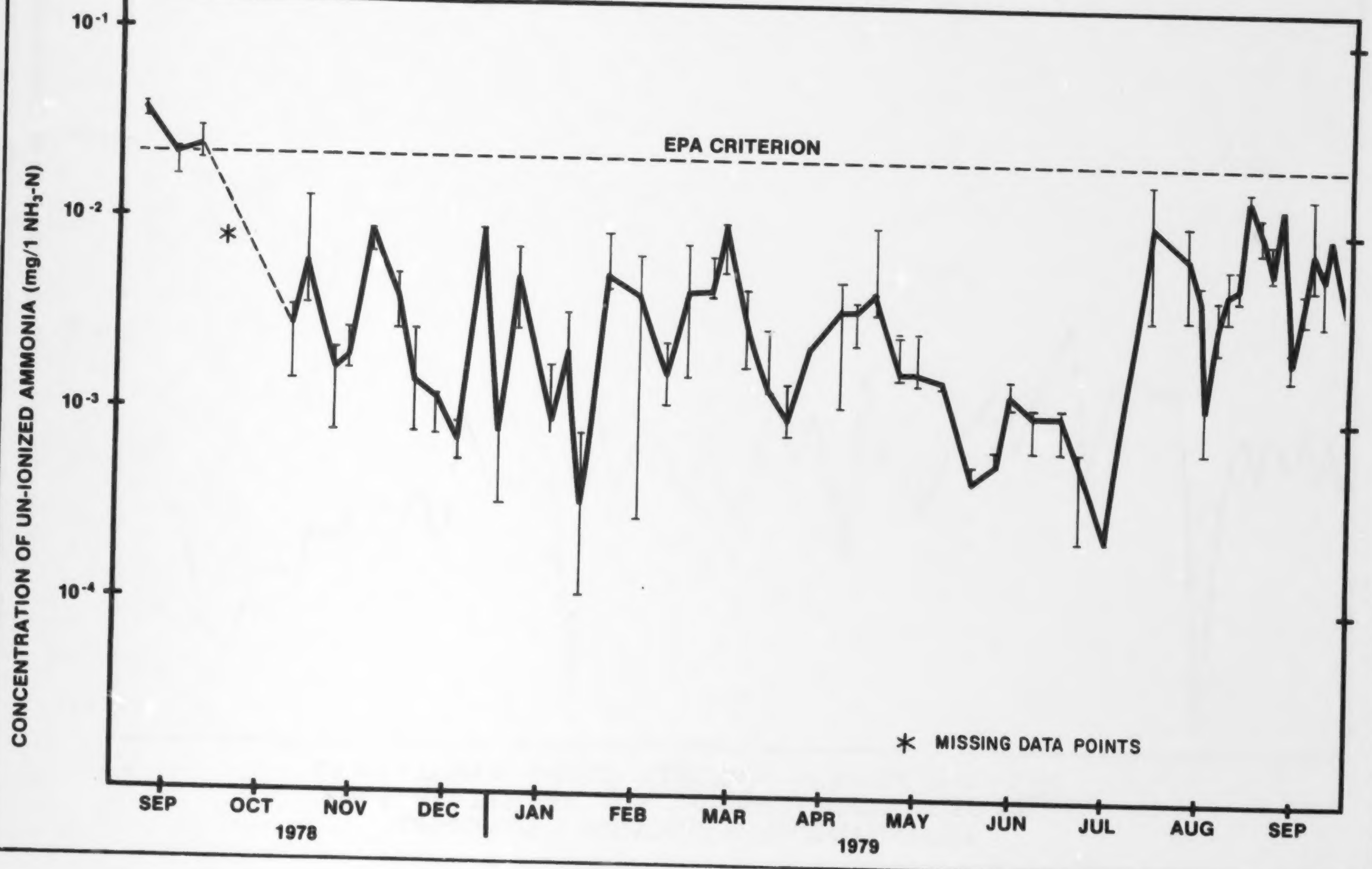


FIGURE 20

UN-IONIZED AMMONIA CONCENTRATION
FROM SEPTEMBER 1976 THROUGH SEPTEMBER 1979
AT STATION 4, PERSIGO WASH

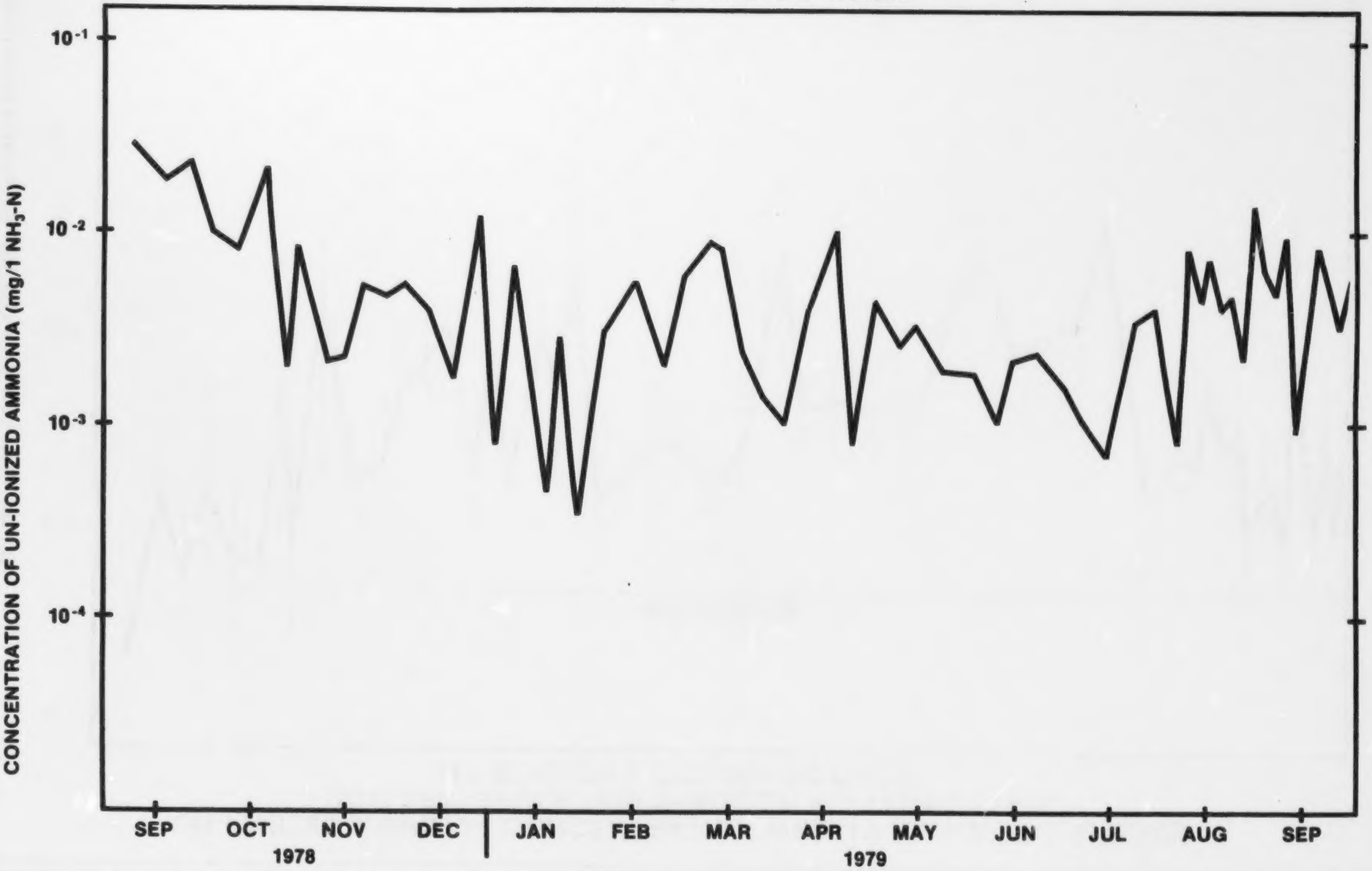
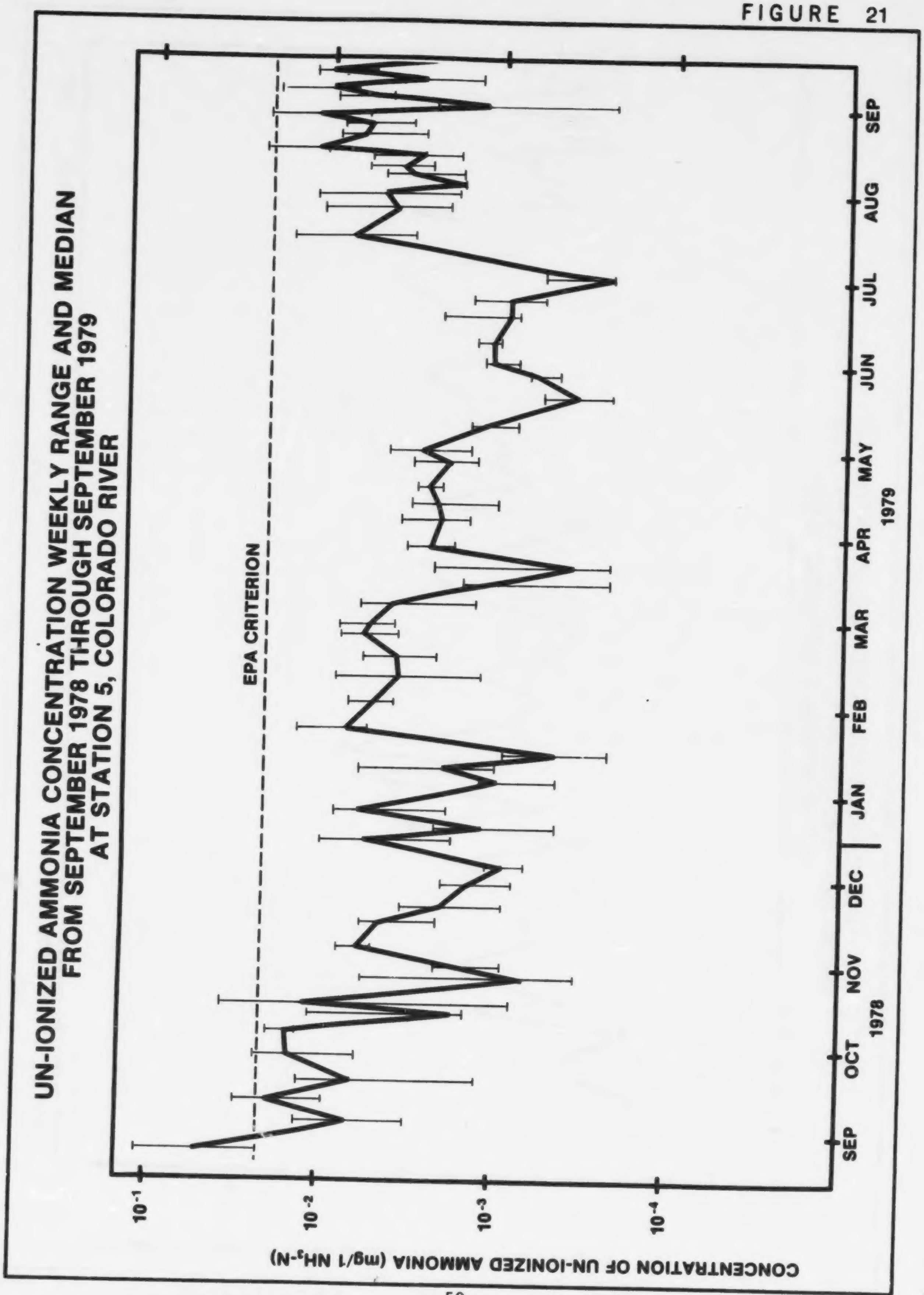


FIGURE 21



UN-IONIZED AMMONIA CONCENTRATION WEEKLY RANGE AND MEDIAN
FROM SEPTEMBER 1978 THROUGH SEPTEMBER 1979
AT STATION 5, COLORADO RIVER

FIGURE 22

UN-IONIZED AMMONIA CONCENTRATION FROM SEPTEMBER 1978 THROUGH SEPTEMBER 1979 AT STATION 6, FRUITA SEWAGE EFFLUENT

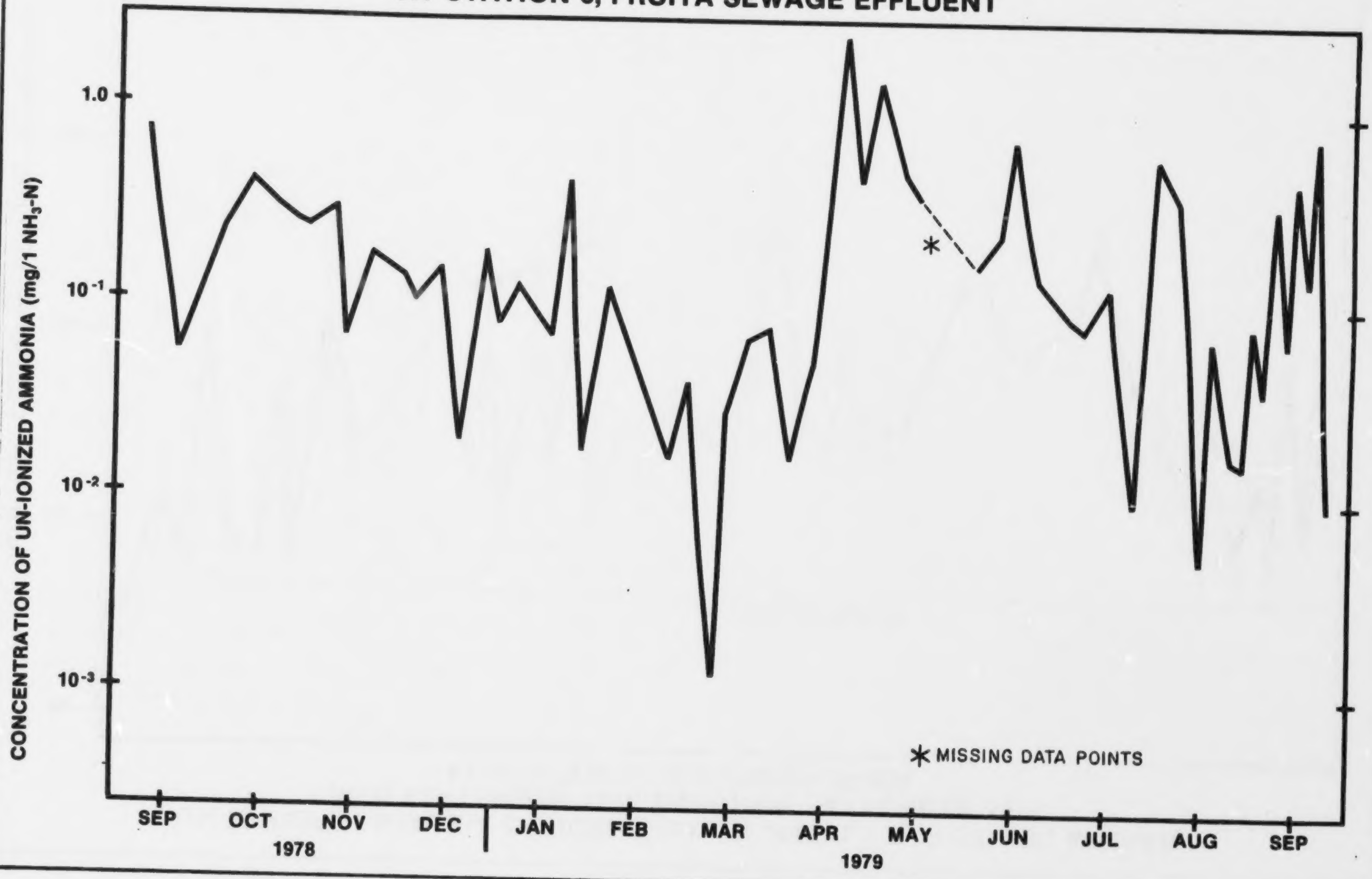


FIGURE 23

UN-IONIZED AMMONIA CONCENTRATION WEEKLY RANGE AND MEDIAN
FROM SEPTEMBER 1978 THROUGH SEPTEMBER 1979
AT STATION 7, COLORADO RIVER

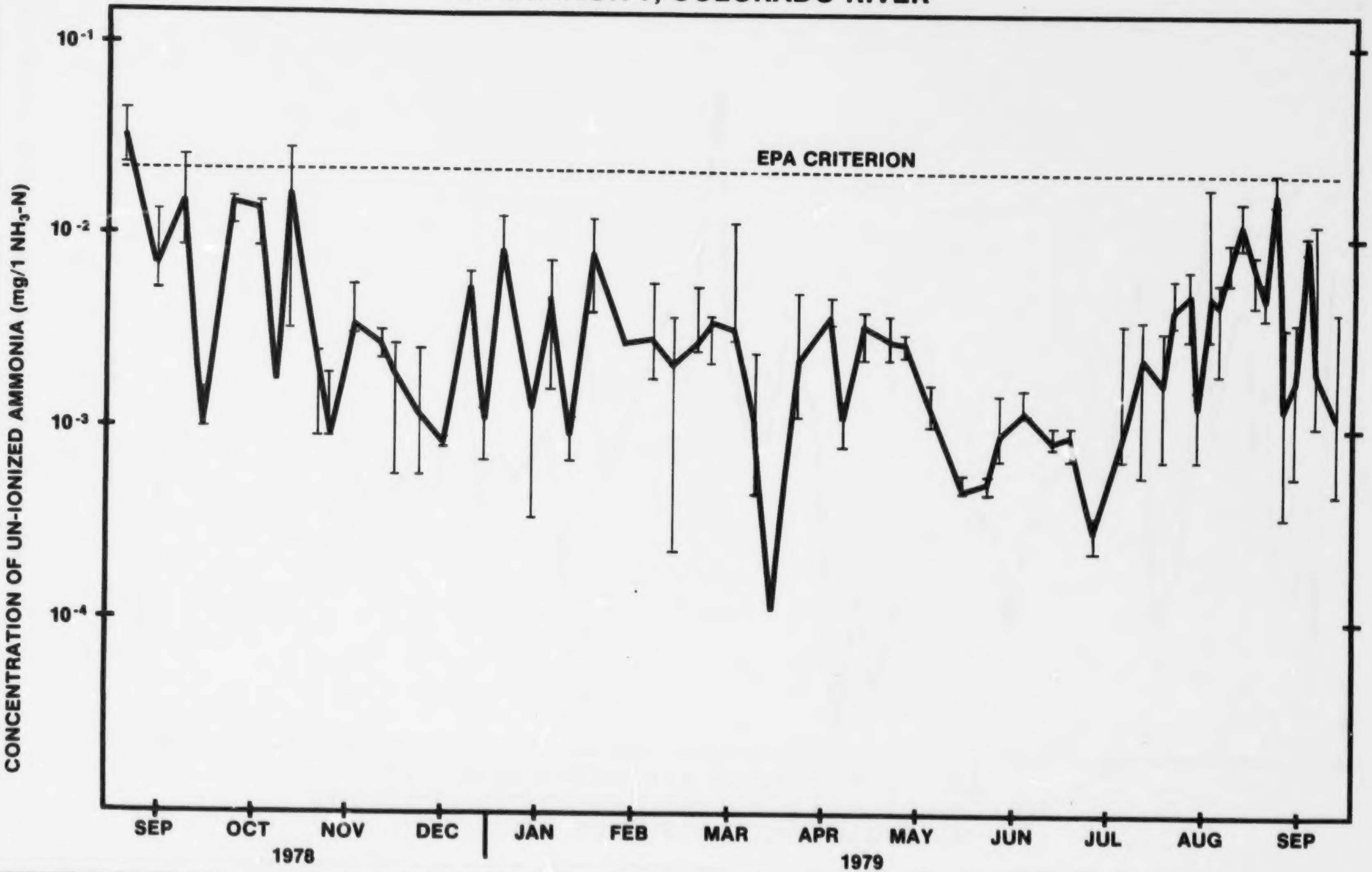


FIGURE 24

UN-IONIZED AMMONIA CONCENTRATION FROM SEPTEMBER 1978 THROUGH SEPTEMBER 1979 AT STATION 8, LITTLE SALT WASH

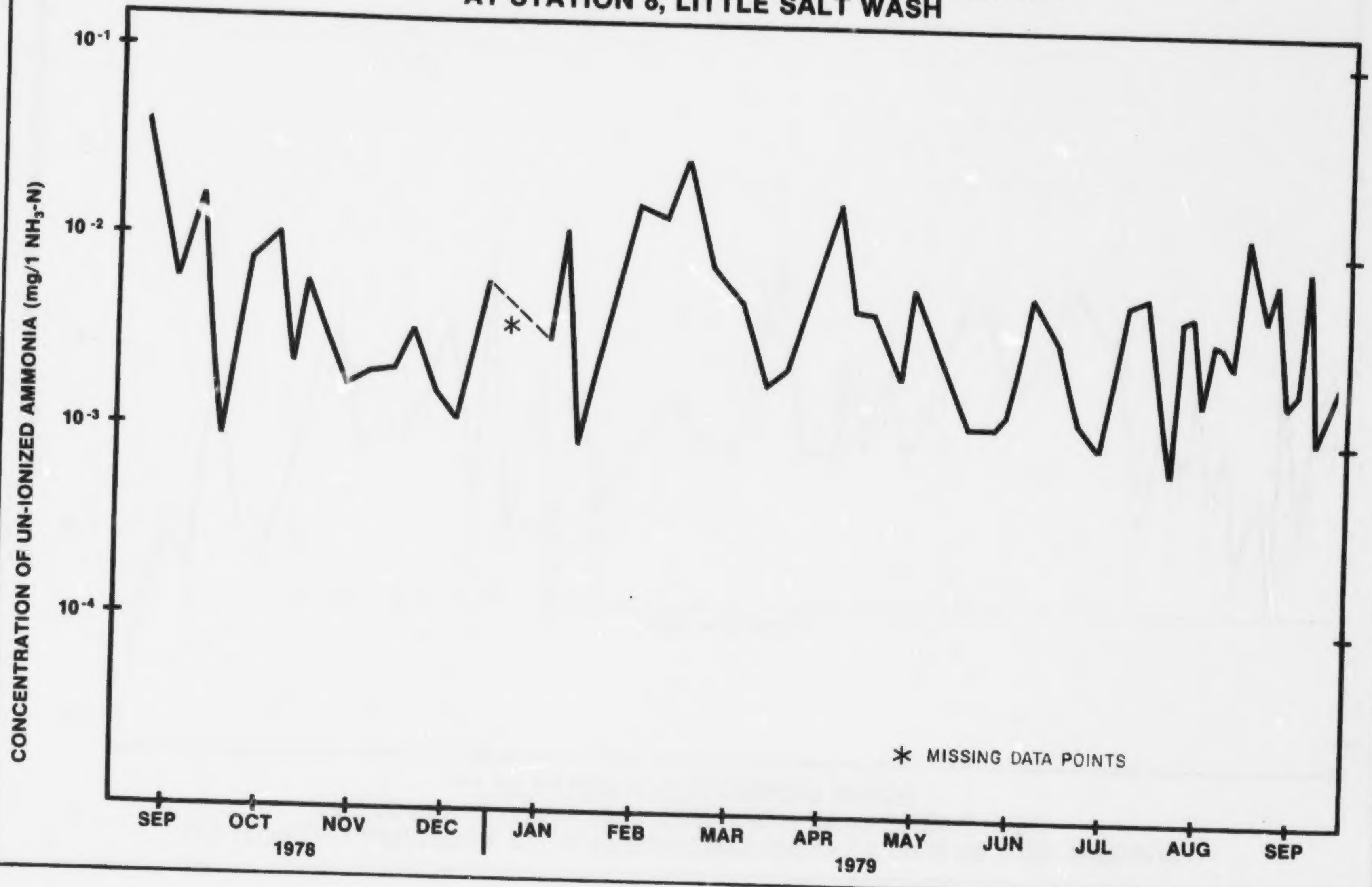


FIGURE 25

UN-IONIZED AMMONIA CONCENTRATION WEEKLY RANGE AND MEDIAN FROM SEPTEMBER 1976 THROUGH SEPTEMBER 1979 AT STATION 9, COLORADO RIVER

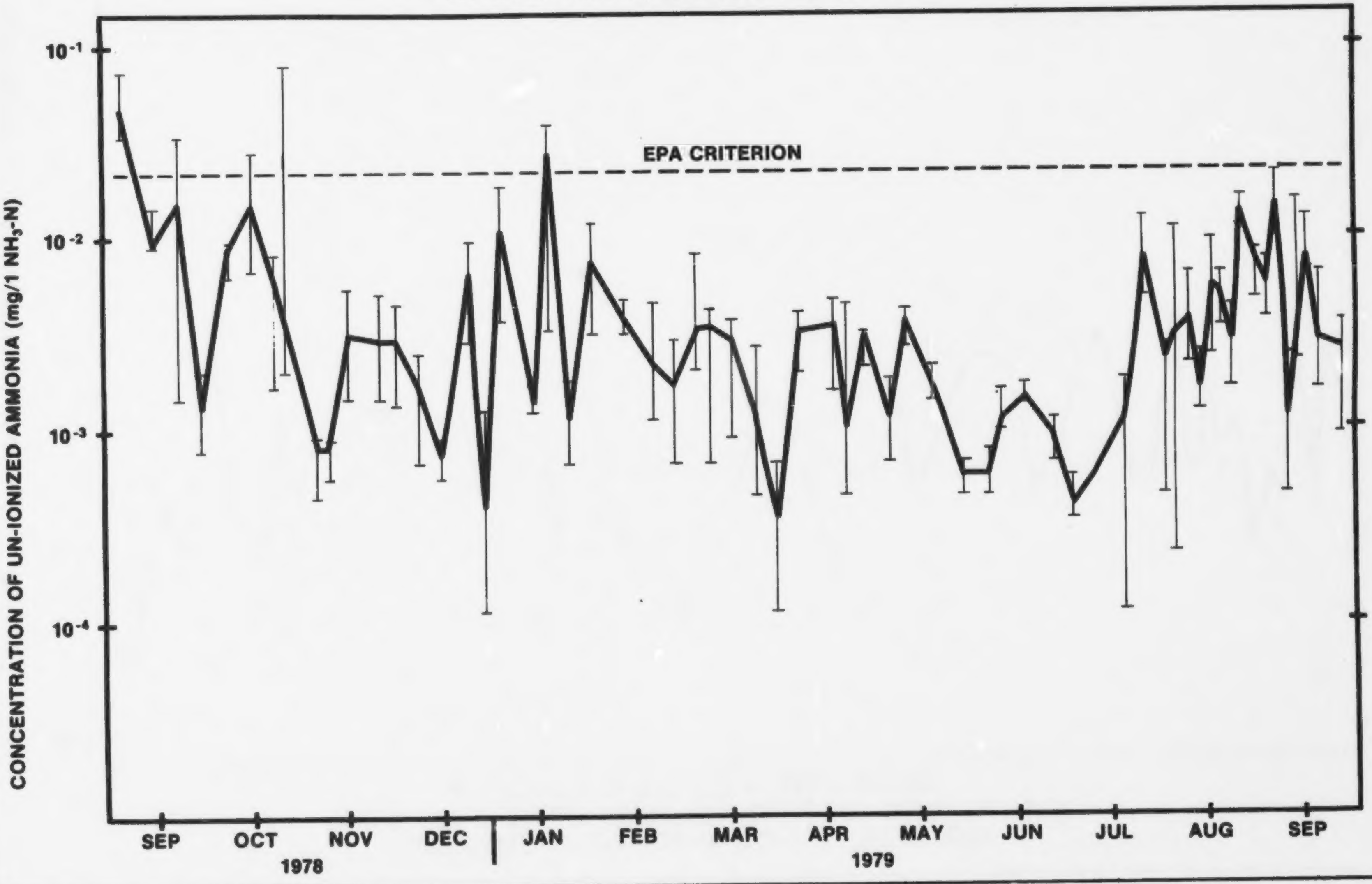
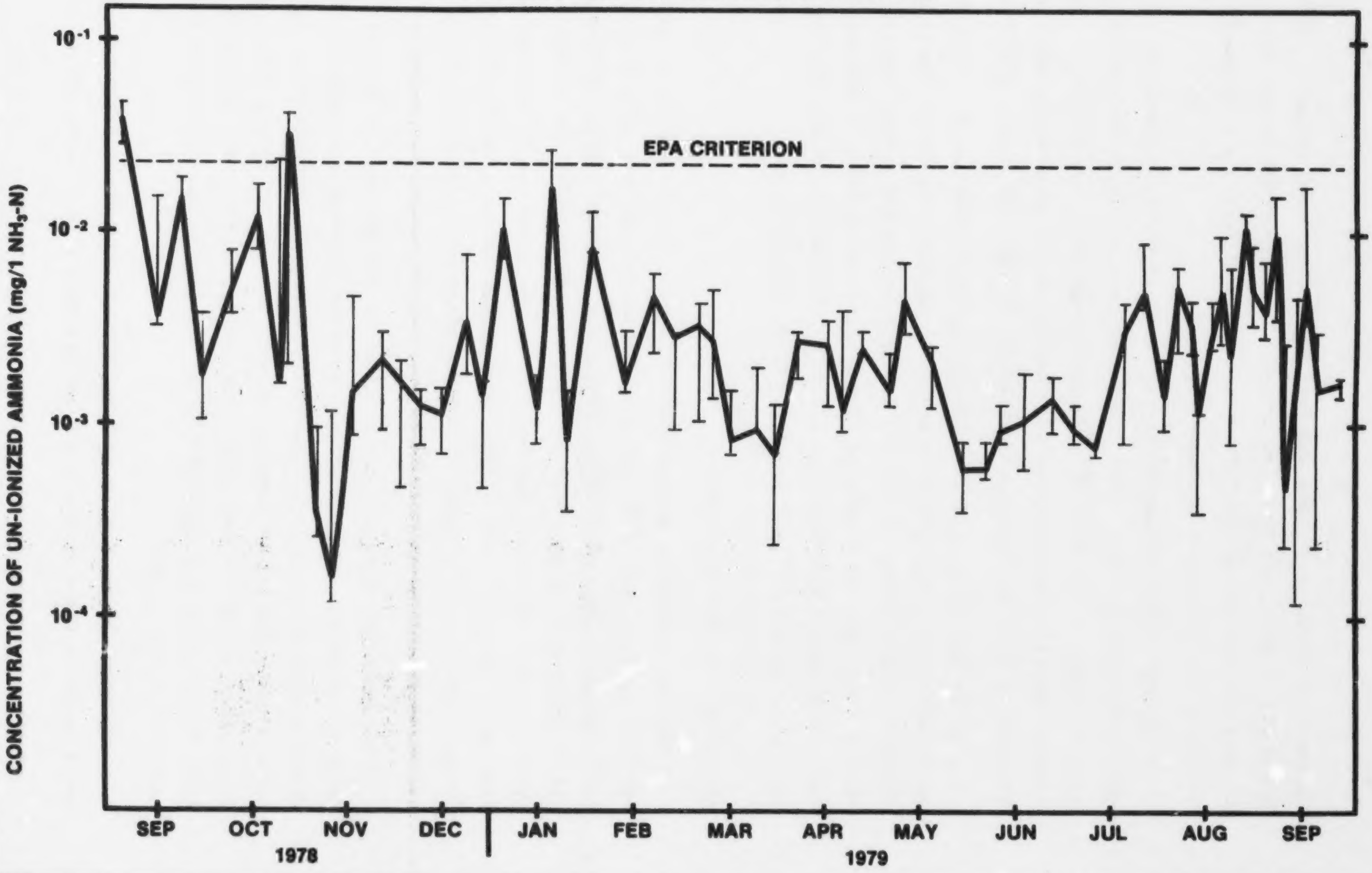


FIGURE 26

UN-IONIZED AMMONIA CONCENTRATION WEEKLY RANGE AND MEDIAN FROM SEPTEMBER 1978 THROUGH SEPTEMBER 1979 AT STATION 10, COLORADO RIVER



appeared to occur in January and February. This, too, seems to correspond with a secondary low flow period. These seasonal trends are highly generalized, and as observed in the measured range, can be easily obscured by the short-term fluctuations.

Ammonia concentrations at Persigo and Little Salt washes did not show a seasonal pattern. Un-ionized ammonia concentrations generally ranged between 0.001 and 0.01 mg/ℓ throughout the study period for both washes. Median concentrations for the two washes were nearly identical with 0.0035 mg/ℓ for Persigo Wash and 0.0030 mg/ℓ for Little Salt Wash.

At the two wastewater discharges, the un-ionized ammonia concentrations reflected a difference in treatment method. The Grand Junction effluent ranged between 0.008 and 1.2 mg/ℓ un-ionized ammonia during the study period; for the discharge from Fruita, the un-ionized ammonia concentration ranged from 0.001 to 2.3 mg/ℓ. The median values for the two discharges were 0.049 mg/ℓ and 0.110 mg/ℓ, respectively.

METHOD OF FLOW DETERMINATIONS

Monthly streamflow measurements were made for the months of September 1978 through July 1979, and weekly measurements were made 14 August 1979 through 26 September 1979. Severe ice and slush conditions prevented gauging on 11 December 1978 and 15 January 1979. Flow from the Grand Junction Wastewater Treatment Plant was noted weekly from an outflow meter outside of the plant. Outfall discharges from the Fruita Sewage Lagoon was determined by monthly stage data and by the rating curve for the existing V-notch weir.

Measurements for the Colorado River at the Broadway Bridge (also referred to as Grand Avenue Bridge) at Grand Junction were made on the upstream side of the bridge. Measurements for the Colorado River at the State Highway 340 Bridge near Fruita were made on the downstream side on 7 September and 10 October 1978. Thereafter, measurements were made from the upstream side because of eddy problems at the downstream side caused by bridge piers.

Equipment being used to measure velocity includes a Price current meter, a Price Pigmy meter, a top setting rod, a hand line, and a crane and reel mounted on a two-wheel base. Where conditions permitted, velocity measurements were made by wading, using the top setting rod. This approach was utilized for the two washes, and the Colorado River near the Broadway Bridge during low-flow periods. Where depths and/or velocities were too great, measurements were made by suspending the flow meter from a cable from bridges. This was necessary for measurements of the Colorado River at the Broadway Bridge during higher flows and at the State Highway 340 Bridge near Fruita.

RESULTS OF FLOW DETERMINATIONS

Streamflow measurements at the two river stations, the two washes, and the Fruita Lagoon Outfall are summarized in Tables 2a and 2b. Table 3 summarized the effluent discharges of the Grand Junction Wastewater Treatment Plant. Variation of flows over the thirteen-month study period are graphically depicted in Figures 27 through 31. As a comparison, Tables B.1a and B.1b in Appendix B show results of flow determinations and presently available USGS flows for their gauges near the study area.

DISCUSSION OF FLOW DETERMINATIONS

Figures 29 and 30 illustrate how Persigo Wash and Little Salt Wash flows vary throughout the year. Measurements conducted 15 May 1979 indicate relatively high runoff rates. Persigo Wash averages approximately 0.12 m^3/s (4.2 cfs) during the months of November through April, and Little Salt Wash averages 0.22 m^3/s (7.8 cfs) for the same period. After the high runoff measurements of May, the normal irrigation season flows for the two washes average 1.35 and 2.16 m^3/s (47.6 and 76.4 cfs), respectively. Throughout the study period, the Grand Junction discharge, measured during hours of peak flow, averaged a relatively constant 0.282 m^3/s (9.90 cfs or 6.4 mgd), and the Fruita Lagoon outfall averaged a relatively constant 0.015 m^3/s (0.54 cfs).

In late September 1978, staff gauges were installed at each of the flow measurement sites. The stage and discharge information were combined to form the rating curves for each site, shown on Figures B.1 through B.8, which are included in Appendix B. During the course of the

TABLE 2a

GAUGED FLOWS
(m^3/s)

Date	Colorado River[1] Broadway Bridge	Colorado River[1] Highway 340 near Fruita	Persigo[2] Wash	Little Salt[2] Wash	Fruita[3] Lagoon Outfall
9/07/78	30	40	1.30	2.24	.014
10/10/78	25	50	1.61	2.75	.031
11/13/78	100	110[4]	0.17	0.17	.011
12/11/78	-	115	-	-	-
1/15/79	-	-	-	0.09	.011
1/22/79	90[4]	110	0.11	-	-
2/15/79	125	150	-	0.17	.010
2/16/79	-	-	0.09	-	-
3/12/79	120	140	0.11	0.36	.010
4/09/79	135	160	0.10	0.30	.011
5/15/79	235	275	3.06	3.29	.018
6/12/79	505	510	1.78	2.10	.025
7/17/79	240	270	1.08	1.19	.011
8/14/79	55	85	1.37	2.11	.014
8/22/79	95	120	1.03	2.42	.016
8/29/79	60	90	1.02	1.97	.015
9/05/79	40	75	0.99	2.00	.014
9/12/79	50	80	1.24	2.27	.015
9/19/79	50	75	1.30	2.29	.014
9/26/79	50	75	2.07	2.41	.017

[1] Flows to nearest 5 m^3/s
[2] Flows to nearest 0.01 m^3/s
[3] Calculated from staff gauge to nearest 0.001 m^3/s
[4] Estimated

TABLE 2b

GAUGED FLOWS
(cfs)

Date	Colorado River[1]		Persigo[2] Wash	Little Salt[2] Wash	Fruita[3] Lagoon Outfall
	Broadway Bridge	Highway 340 near Fruita			
9/07/78	1000	1500	46	79	0.5
10/10/78	900	1700	57	97	1.1
11/13/78	3500	4000[4]	6	6	0.4
12/11/78	-	-	-	-	-
1/15/79	-	-	-	3	0.4
1/22/79	3200[4]	3900	4	-	-
2/15/79	4500	5400	-	6	0.3
2/16/79	-	-	3	-	-
3/12/79	4300	4900	4	13	0.4
4/09/79	4700	5700	4	11	0.4
5/15/79	8300	9800	108	116	0.6
6/12/79	17800	18000	63	74	0.9
7/17/79	8400	9500	38	42	0.4
8/14/79	2000	3000	48	75	0.5
8/22/79	3300	4300	37	86	0.6
8/29/79	2100	3200	36	70	0.5
9/05/79	1400	2600	35	71	0.5
9/12/79	1700	2700	44	80	0.5
9/19/79	1800	2700	46	81	0.5
9/26/79	1800	2600	73	85	0.6

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[1] Flows to nearest 100 cfs
[2] Flows to nearest 1 cfs
[3] Calculated from staff gauge to nearest .1 cfs
[4] Estimated

TABLE 3

DISCHARGE FLOWS[a] AT GRAND JUNCTION TREATMENT PLANT

Week	Date	Flow (mgd)	Flow (m^3/d)
1	09/08/78	5.8	22,000
2	09/19/78	4.8	18,000
3	09/26/78	6.0	23,000
4	10/03/78	5.5	21,000
5	10/12/78	5.8	22,000
6	10/20/78	6.75	25,000
7	10/26/78	7.3	28,000
8	10/31/78	6.8	26,000
9	11/09/78	5.8	22,000
10	11/13/78	5.8	22,000
11	11/20/78	5.8	22,000
12	11/29/78	6.5	25,000
13	12/03/78	5.9	22,000
14	12/12/78	5.8	22,000
15	12/18/78	6.2	23,000
16	12/27/78	5.8	22,000
17	01/01/79	7.7	29,000
18	01/08/79	6.4	24,000
19	01/17/79	7.5	28,000
20	01/22/79	5.5	21,000
21	01/27/79	6.5	25,000
22	02/05/79	5.3	20,000
23	02/15/79	5.5	21,000
24	02/24/79	14.5	55,000
25	03/01/79	5.5	21,000
26	03/08/79	6.4	24,000
27	03/12/79	5.3	20,000
28	03/19/79	5.3	20,000
29	03/26/79	6.3	24,000
30	04/02/79	5.5	21,000
31	04/09/79	5.3	20,000
32	04/19/79	5.1	19,000
33	04/23/79	5.0	19,000
34	04/30/79	6.5	25,000
35	05/08/79	6.3	24,000
36	05/13/79	4.5	17,000
37	05/21/79		
38	06/01/79		
39	06/08/79		
40	06/13/79	5.8	22,000
41	06/20/79	8.0	30,000
42	06/30/79	6.8	26,000
43	07/05/79	6.8	26,000
44	07/13/79	6.3	24,000
45	07/21/79	6.8	26,000
46	07/27/79	7.5	28,000
47	08/04/79	6.8	26,000
48A	08/07/79	6.8	26,000
48B	08/11/79	6.6	25,000
49A	08/14/79	7.0	26,000
49B	08/18/79	5.0	19,000
50A	08/21/79	6.6	25,000
50B	08/25/79	6.0	23,000
51A	08/28/79	7.6	29,000
51B	09/02/79	5.5	21,000
52A	09/05/79	7.5	28,000
52B	09/08/79	7.5	28,000
53A	09/11/79	7.0	26,000
53B	09/15/79	7.5	28,000
54A	09/18/79	6.5	25,000
54B	09/22/79	7.7	29,000
55A	09/25/79	6.3	24,000
55B	09/29/79	7.5	28,000
	Average	6.4	24,000

[a] Flows measured between 10:00 a.m. and 2:00 p.m.

FIGURE 27

GAUGED FLOWS FOR COLORADO RIVER AT BROADWAY BRIDGE

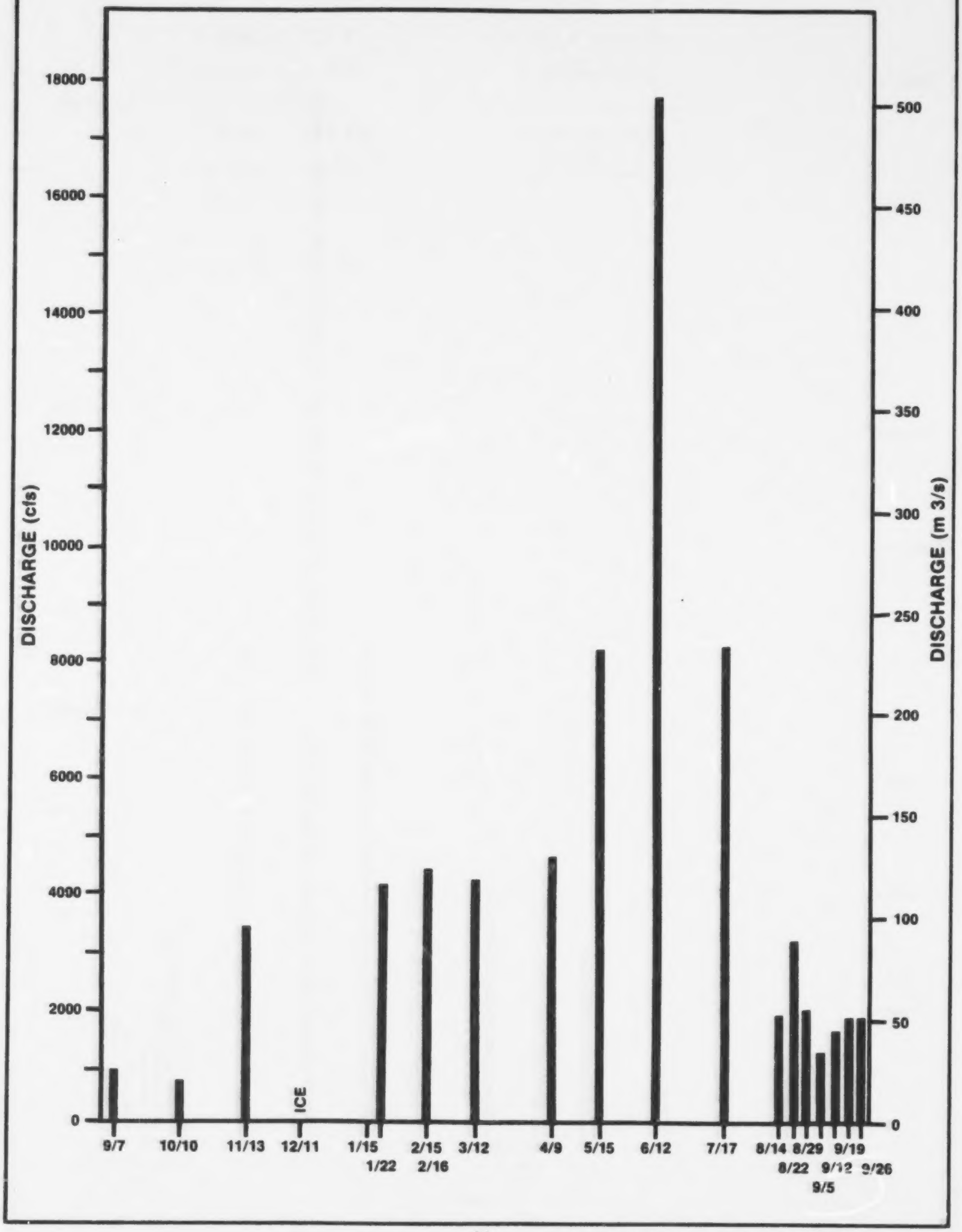
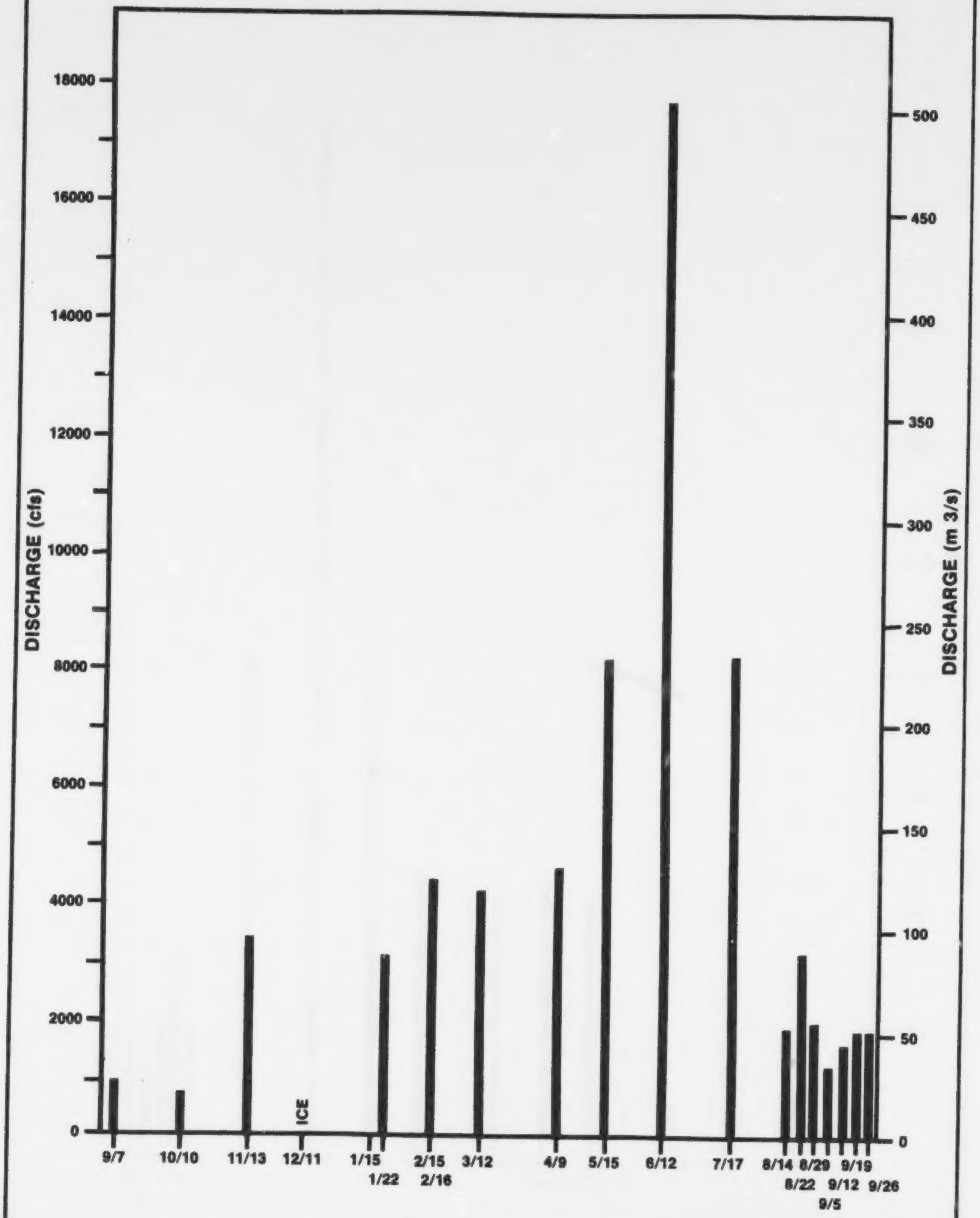


FIGURE 28

GAUGED FLOWS FOR COLORADO RIVER
AT HWY. 340 NEAR FRUITA



GAUGED FLOWS FOR PERSIGO WASH AT INTERSTATE 70

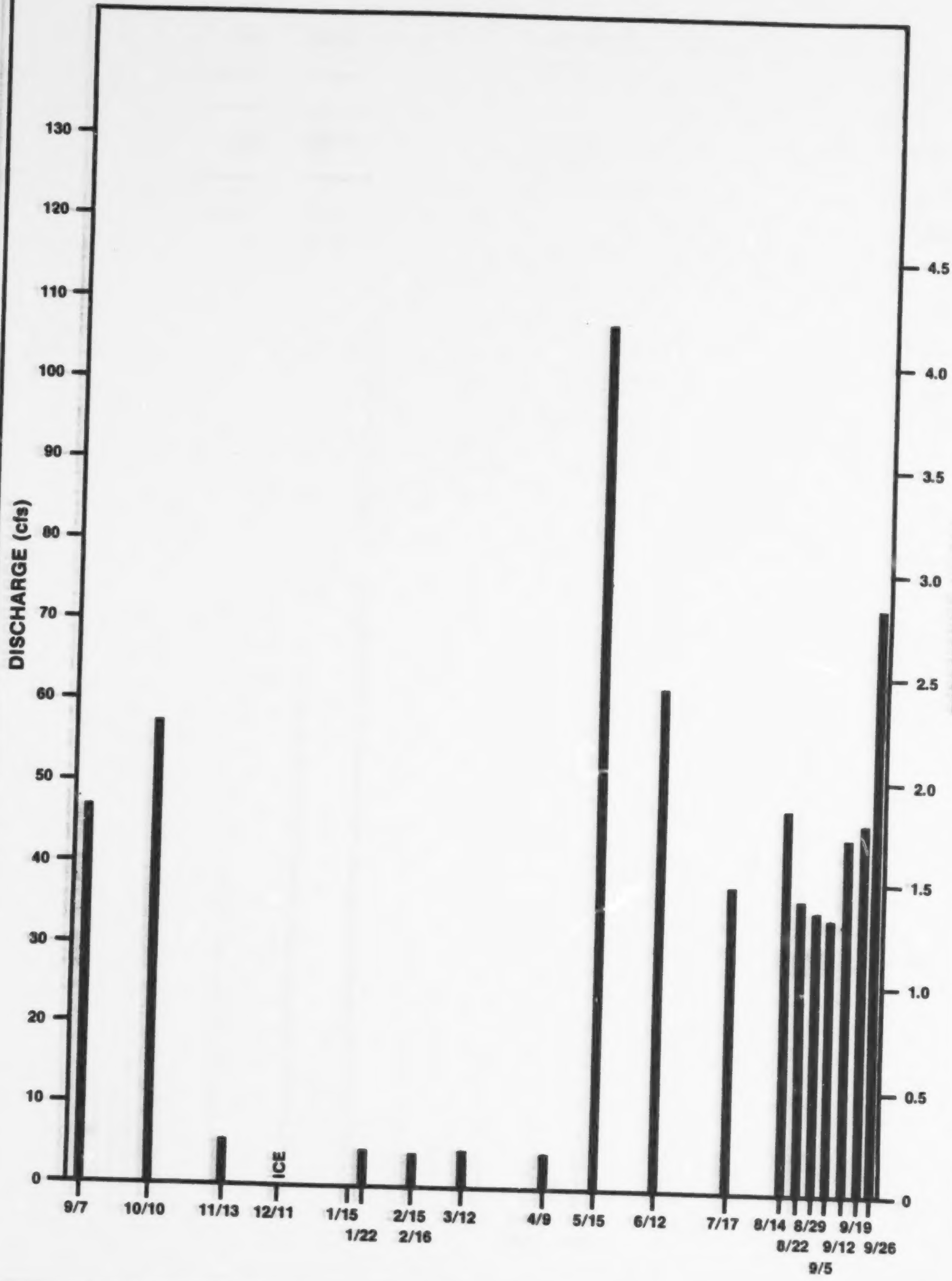


FIGURE 30

GAUGED FLOWS FOR LITTLE SALT WASH AT U.S. HWY. 6

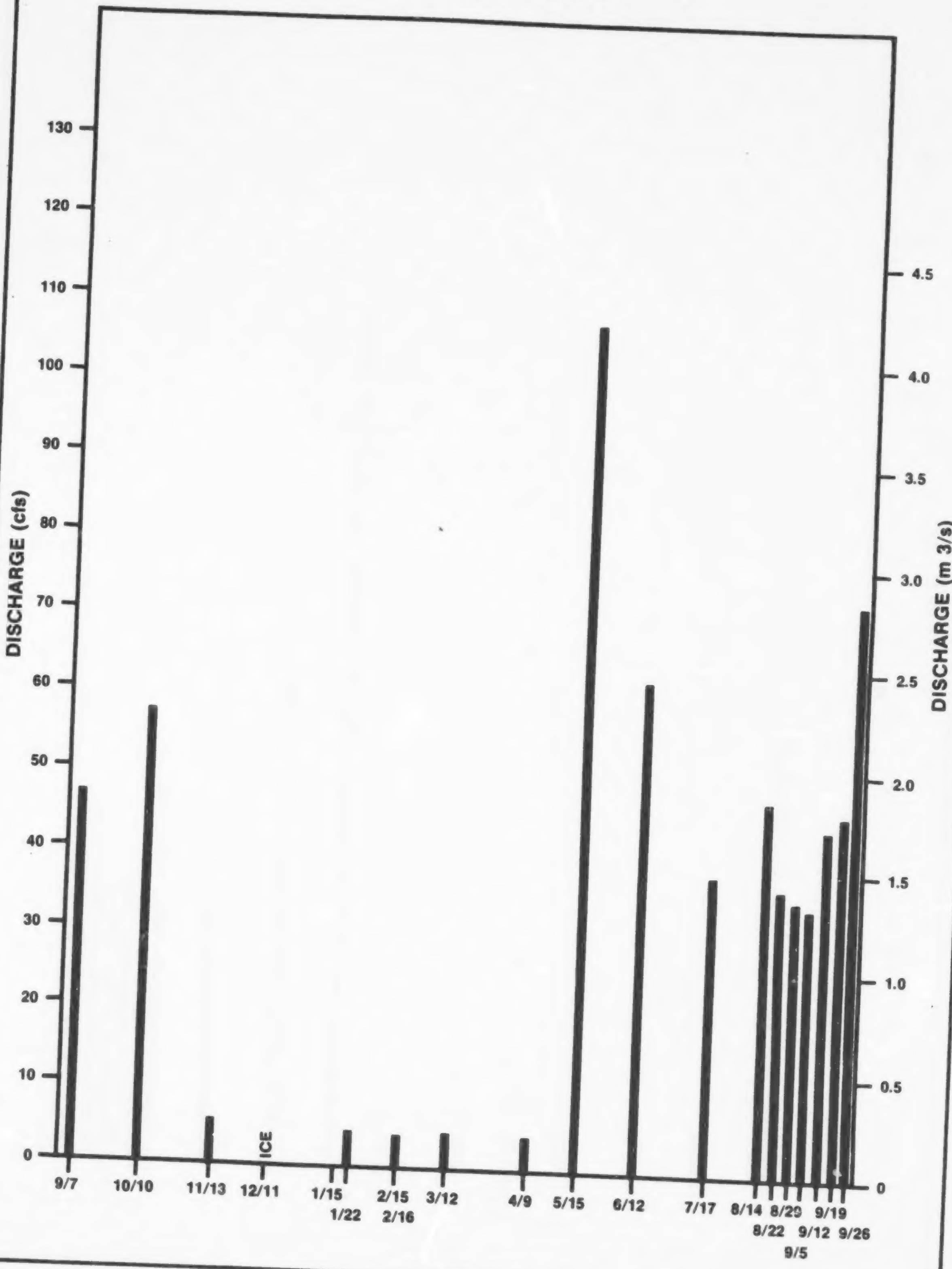
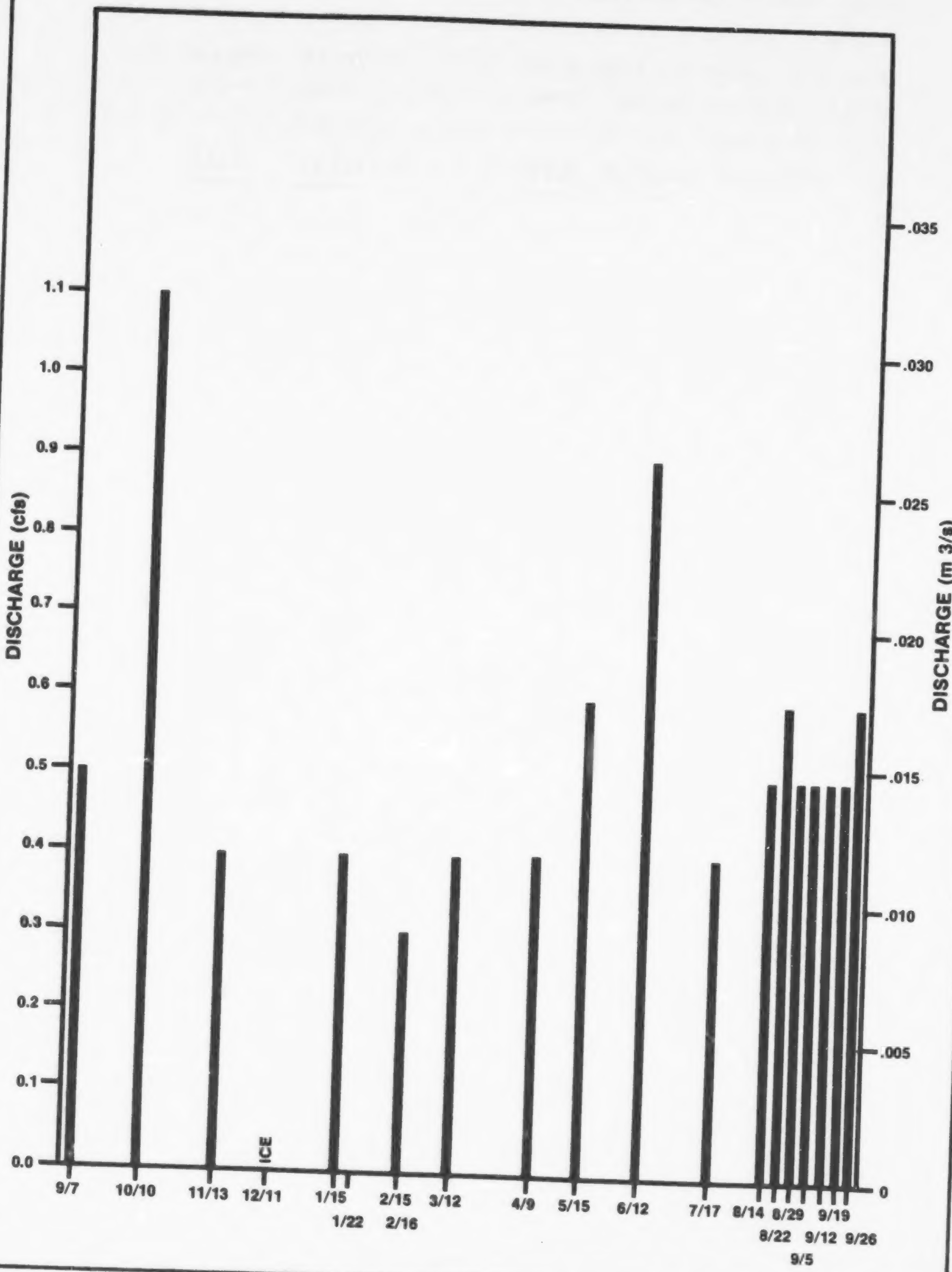


FIGURE 31

GAUGED FLOWS FOR FRUITA LAGOON OUTLET



study, some of the staff gauges were relocated due to problems with backwater obscuring accurate stage levels. After 15 May 1979, staff gauge readings on the Colorado River were not possible because high flows covered the gauges. Sometime during the high flow period, these gauges were lost. Analysis of the rating curves indicates a defined relation between stage and discharge for each site.

SECTION 4

HISTORICAL PERSPECTIVE ON REPRESENTATIVE CONDITIONS IN COLORADO RIVER NEAR GRAND JUNCTION

SECTION 4

HISTORICAL PERSPECTIVE ON REPRESENTATIVE CONDITIONS IN COLORADO RIVER NEAR GRAND JUNCTION

Historical data examined for the calculation of representative conditions include water quality data from the Colorado Department of Health from 1968 to 1978 and U.S. Geological Survey from 1960 to the present. Representative conditions were selected, in the perspective of historical data, to describe a combination of conditions that would produce conservative, but not necessarily worst-case, estimates of monthly un-ionized ammonia concentrations.

WATER QUALITY

Water quality data for three stations on the Colorado River in the vicinity of the study area were retrieved from STORET, EPA's nationwide computerized storage-retrieval system for a vast array of information on the quality of various waterways. The three stations are located near Cameo, about 28 km (18 mi) upstream of Grand Junction; near Fruita; and near Loma, about 8 km (5 mi) downstream of Fruita. For all three stations, approximately three to ten data points are available for each year from 1968 to 1978, with one exception. At the station near Loma, 18 to 36 data points are available from 1974 to 1977. The range and median values of temperature, pH and total ammonia for these stations for each month of the year are reproduced in Table 4. In Figures 32,33 and 34, monthly median values for these three parameters for the station near Loma are used to

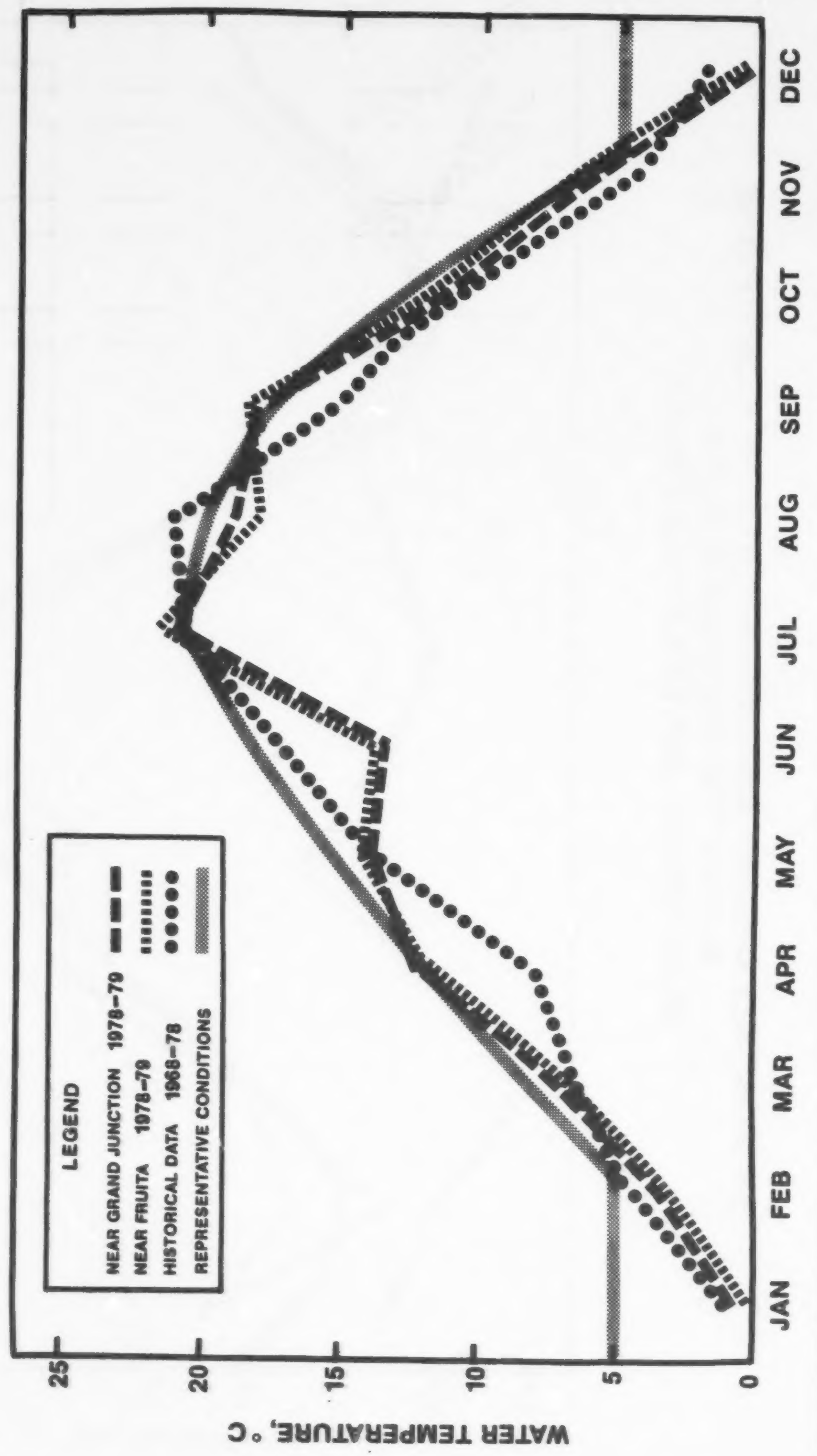
TABLE 4

MONTHLY RANGES AND MEDIANS OF COLORADO RIVER WATER QUALITY DATA(a), 1968-78, AT THREE STATIONS NEAR GRAND JUNCTION

Month	Near Cameo (4-9 points)			Near Fruita (5-8 points)			Near Loma (11-18 points)		
	Temp. °C	pH	Tot NH_3 mg/ℓ	Temp. °C	pH	Tot NH_3 mg/ℓ	Temp. °C	pH	Tot NH_3 mg/ℓ
JANUARY	00.0-00.0 0	7.6-8.2 8.2	0.04-1.00 0.8	0.00-01.1 0	7.4-8.6 8.15	0.00-0.6 0.18	00.0-03.9 0	7.4-8.9 8.3	0.0-0.59 0.04
FEBRUARY	00.0-03.3 1.4	7.7-8.8 8.15	0.50-1.40 1.0	01.10-06.7 3.9	7.9-8.7 8.1	0.60-1.2 0.9	01.10-06.7 3.9	7.8-8.8 8.45	0.0-1.2 0.2
MARCH	02.2-07.8 6.1	7.2-8.6 8.1	0.00-0.82 0.6	02.80-10.0 5.25	7.7-8.7 8.2	0.00-0.5 0.2	02.80-11.1 6.7	7.3-8.8 8.6	0.0-0.6 0.04
APRIL	06.7-12.8 10.0	7.5-8.6 8.1	0.00-0.08 0.06	06.60-13.9 11.1	7.3-8.7 8.2	0.00-0.34 0.04	03.90-15.6 7.8	7.7-8.9 8.4	0.0-1.1 0.0
MAY	09.4-15.0 11.9	8.1-9.0 8.4	0.00-0.1 0.08	10.00-17.2 10.8	8.0-8.6 8.4	0.00-0.16 0.0	08.90-19.4 13.9	7.4-9.4 8.1	0.0-4.0 0.08
JUNE	12.2-17.2 14.4	8.0-8.6 8.4	0.00-0.29 0.17	12.20-16.7 15.5	7.8-8.7 8.2	0.00-1.1 0.19	11.10-22.2 17.2	7.8-8.8 8.3	0.0-1.2 0.10
JULY	17.2-22.8 20.0	7.7-9.0 8.6	0.04-0.1 0.04	20.00-24.4 20.0	8.1-8.5 8.2	0.00-0.35 0.08	18.90-26.70 21.1	8.0-9.1 8.4	0.0-0.71 0.05
AUGUST	15.0-22.2 20.0	7.6-8.8 8.4	0.16-0.25 0.20	17.80-24.4 19.40	7.6-8.7 8.2	0.00-0.16 0.0	16.70-26.10 21.1	8.0-8.7 8.3	0.0-0.5 0.0
SEPTEMBER	12.2-27.8 15.5	7.9-8.7 8.4	0.00-0.28 0.02	13.30-24.4 16.7	8.0-8.4 8.2	0.00-0.8 0.1	08.90-24.4 15.5	7.9-8.6 8.2	0.0-1.2 0.05
OCTOBER	06.7-15.5 12.2	7.6-8.6 8.1	0.00-0.25 0.05	07.80-16.7 12.8	7.4-8.6 8.35	0.00-0.25 0.16	07.80-15.6 12.2	7.4-8.7 8.3	0.0-1.9 0.12
NOVEMBER	00.0-06.1 3.9	7.6-8.9 8.3	0.00-0.7 0.05	01.10-06.1 3.9	7.6-8.8 8.3	0.21-0.25 0.23	02.20-07.8 5.0	7.6-8.8 8.4	0.0-0.48 0.0
DECEMBER	00.0-02.2 1.1	8.1-8.6 8.3	0.30-0.30 0.3	00.00-04.4 1.6	7.8-8.8 8.4	0.00-0.45 0.28	-00.60-04.4 2.2	8.1-8.9 8.5	0.0-0.38 0.05

(a) Data from EPA's computer storage system, STORET, from Colorado Department of Health, Water Quality Division.

FIGURE 32



WATER TEMPERATURES MONTHLY MEDIAN AND REPRESENTATIVE CONDITIONS ALONG THE COLORADO RIVER NEAR GRAND JUNCTION AND FRUITA

pH MONTHLY MEDIAN AND REPRESENTATIVE CONDITIONS
ALONG THE COLORADO RIVER
NEAR GRAND JUNCTION AND FRUITA

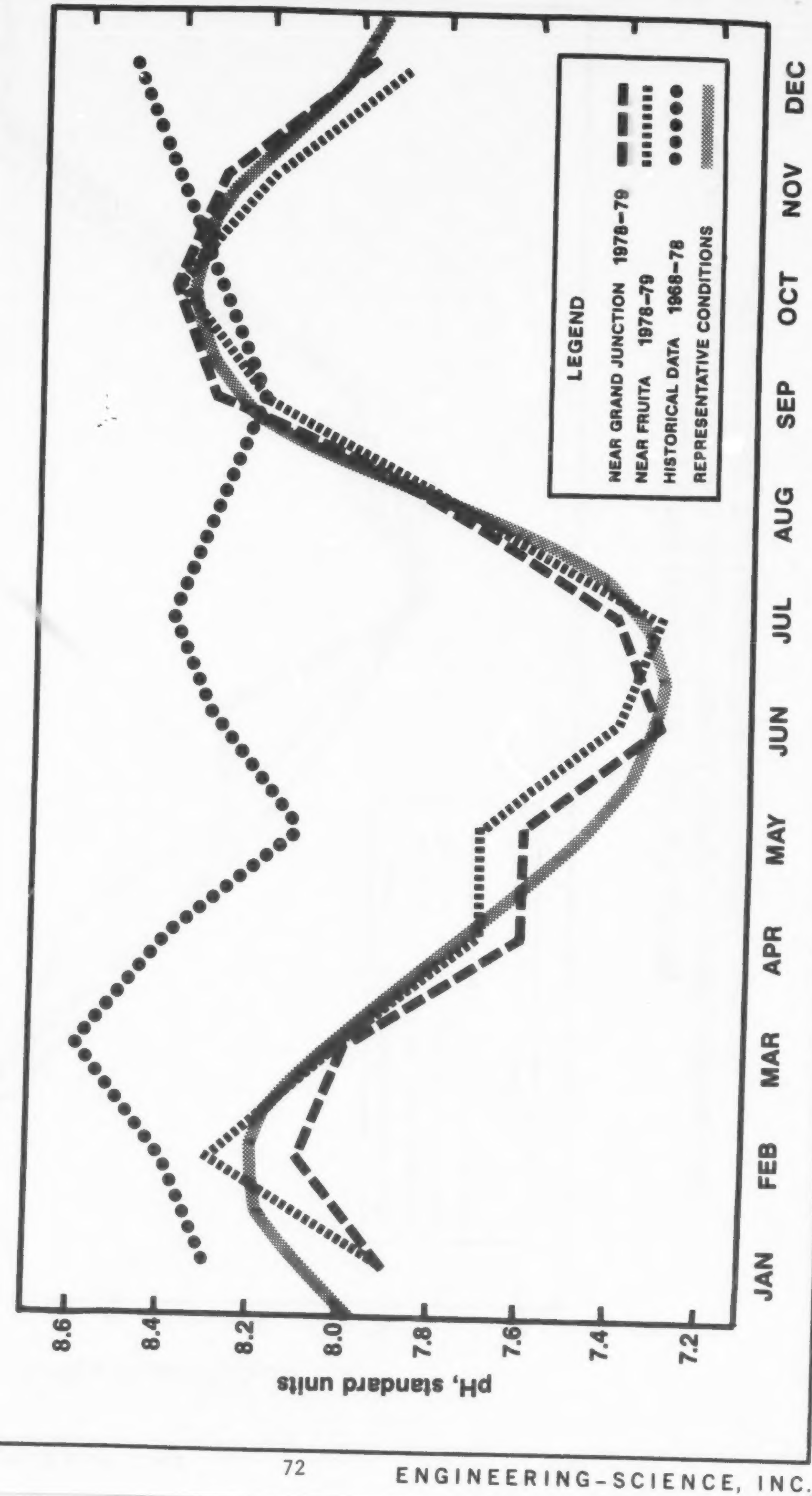
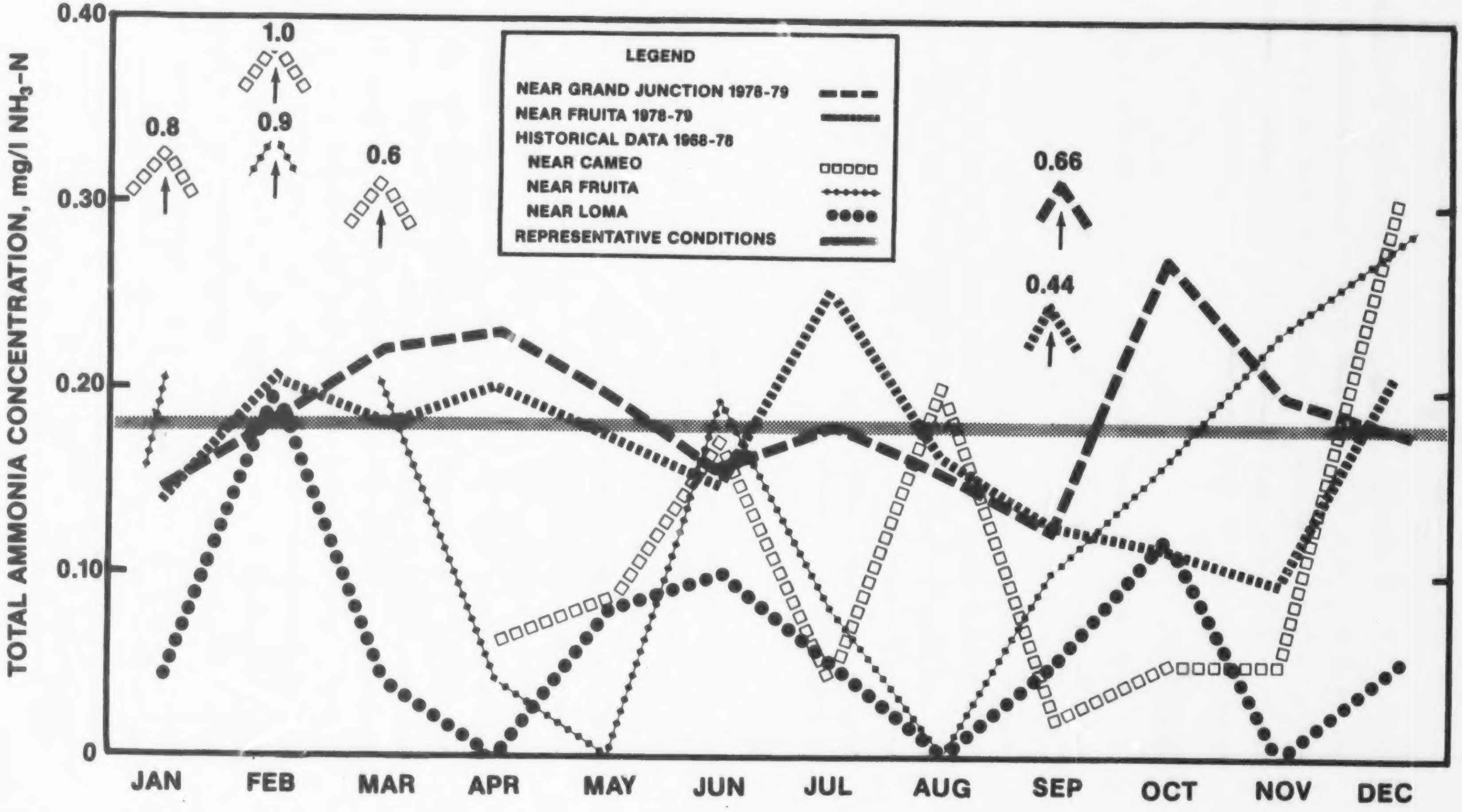


FIGURE 34

TOTAL AMMONIA MONTHLY MEDIAN CONCENTRATIONS AND REPRESENTATIVE CONDITIONS ALONG THE COLORADO RIVER NEAR GRAND JUNCTION AND FRUITA



represent the historical data because this station has the most historical data available. On the same three figures, corresponding monthly median values of the same parameters, determined from over 2,000 samples measured near Grand Junction and Fruita during this study, are also presented.

Temperature

A distinct seasonal pattern is observed for the three stations, as shown on Figure 32. The pattern, for historical data near Loma, is very closely followed by data obtained near Grand Junction and Fruita. A smooth, generalized curve, drawn through the historical data and the 1978-79 data, is used to represent typical river temperature conditions for the projection of future conditions and computations of un-ionized ammonia concentration. At times when river temperatures fall below 5°C, the representative temperature is assumed to be 5°C for the purposes of this study.*

pH

The seasonal pattern of variation of pH in the river, shown on Figure 33 for 1978-79, was not similar to that of the historical record. The difference is both in the trends and values. Previous years' recorded median pH values seem to be generally higher and more or less consistent throughout the year, about 8.3. (It should be noted that the historical data include pH values which are unusually high, with several values greater than 9.0 and as high as 9.4 in one instance.) By contrast, the 1978-79 pattern was distinctly seasonal. During the warm months, pH was generally lower, reaching a minimum of 7.3. The greatest difference between historical and 1978-79 values was one pH unit in June and July. However, because the historical data are represented by the median of 15 data points and the 1978-79 data are represented by the median of 60 to 75 points for these months, it was decided that the 1978-79 data would more accurately represent river conditions. A smooth curve was drawn through the Grand Junction and Fruita data, which were in close agreement. This curve was then used in subsequent computations for monthly pH values.

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*The reason for this decision is presented in Section 3.

Total Ammonia

Total ammonia (NH_3 and NH_4^+) is the most important background water quality parameter measured for the purposes of this study. The monthly medians for historical data are shown in Figure 34 for the three stations for which data are available. Fluctuations in ammonia concentration are relatively great for historical data, in comparison with the 1978-79 conditions, although no seasonal trend is apparent in either case. Sporadically anomalous and high values (such as 0.6, 0.9 and 1.0 mg/ℓ) are encountered in both the historical and 1978-79 data. Otherwise, it appears that the 1978-79 data were only slightly higher than the general trends of the historical data. It would then appear that the conservative approach would be to use the 1978-79 generalizing background pattern for un-ionized ammonia computations. Therefore, a straight line, at the 0.18 mg/ℓ level is superimposed on Figure 34 to depict representative background conditions throughout the year.

FLOW

Table 5 summarizes pertinent streamflow information which is published by the U. S. Geological Survey (USGS). Two gauges were once located within the study area. They are the Colorado River at Grand Junction which was active from 1897 to 1899, and the Colorado River near Fruita which was active from 1908 to 1923. Other historic information is available for the Colorado River near Palisade, a short distance upstream, from 1902 to 1933. Three gauges in the vicinity of the study area are presently maintained by the USGS. The Colorado River near Cameo gauge, located approximately 39 km (24 miles) upstream from Grand Junction has been in operation since 1931. The Colorado River gauge near the Colorado-Utah state line has been in operation since 1951 and is located approximately 29 km (18 miles) downstream of Fruita. The gauge on the Gunnison River near Grand Junction was operated from 1894 to 1895, 1901 to 1906, and 1916 to the present. Its location has been changed a number of times. The longest overlapping period for the three gauges in their present locations is April 1960 to the present.

TABLE 5

USGS GAUGING STATIONS

Name	Number	From	To
Colorado River near Cameo[1]	09095500	1931	Present
Colorado River at Grand Junction	09106500	1894	1895
		1896	1899
		1900	1900
Colorado River near Fruita	09153000	1907	1923
Colorado River near State Line[1]	09163500	1951	Present
Gunnison River near Grand Junction[1,2] (also at Whitewater)	09152500	1894	1895
		1896	1899
		1901	1906
		1916	Present
Colorado River near Palisade	163	1901	1933

[1] Used in Pearson Log III analysis
[2] Gauge relocated several times

Representative Conditions--Low Flow Projections

Low flow projections can be made from statistical analysis of streamflow data. Generally, the longer the period of record, the more reliable the information obtained from statistical analyses.

A Pearson Log III type analysis was performed on the three existing streamflow gauges utilizing the period April 1960 through the present. Annual and monthly seven-day low flows were identified and ranked. The Pearson Log III technique generates estimated seven-day low flow values corresponding to specific probabilities. Included are the estimates for the seven-day low flows to be expected once in ten years on the average. This information is summarized on Tables 6a and 6b.

The gauge for the Colorado River at Cameo and the gauge for the Gunnison River near Grand Junction are indicators of the amount of water supply available upstream of the study area. The downstream gauge on the Colorado River near the Utah state line is an indicator of the amount of water which leaves the study area. It is believed to include the effects of all irrigation and power return flow within the tributary area above it. In between the upstream and downstream gauges, flows are affected by the amount of tributary area, and the amount of surface diversions and/or return flow from irrigation and power generation. Just downstream of the Colorado River gauge near Cameo, but upstream of the study area, are major diversions for the Grand Valley Project, which includes the Government Highline Canal, the Orchard Mesa Project and some power generation. Just downstream of this diversion is another major diversion for irrigation, the Grand Valley Canal. Downstream from the gauge on the Gunnison River is a major diversion for the Redlands Power Canal and irrigation project. The Redlands diversion is shown on Figure 1.

Return flows from the power portion of the Grand Valley Project diversions occur upstream of the study area, while irrigation return flows occur upstream, within, and downstream of the study area. Return flow from the power portion of the Redlands diversion on the Gunnison River occurs within the project area as does the return flow attributable to irrigation. Table 7 summarizes the average flows attributable

TABLE 6a
7-DAY LOW FLOWS EXPECTED ONCE IN 10 YEARS[1]
(m^3/s)

Period	Colorado River at Cameo	Colorado River Near State Line	Gunnison River Near Grand Junction
January	33.1	53.0	16.1
February	33.2	56.6	16.6
March	33.3	55.4	16.5
April	44.5	55.0	20.1
May	59.4	73.4	31.5
June	97.4	101.2	22.9
July	52.4	44.3	12.7
August	47.7	39.4	13.1
September	46.7	48.9	16.2
October	44.5	60.2	18.1
November	41.1	70.9	21.6
December	35.9	55.5	17.4
Annual	31.4	36.8	12.1

---

[1] Statistically derived from 1960-1978 period of record.

TABLE 6b

7-DAY LOW FLOWS EXPECTED ONCE IN 10 YEARS[1]

(cfs)

Period	Colorado River at Cameo	 near State Line	Gunnison River near Grand Junction
January	1168 (min)	1873	570
February	1174	1999	587
March	1176	1956	582
April	1570	1942	711
May	2097	2592	1111
June	3441	3574	807
July	1849	1564	450 (min)
August	1686	1390 (min)	462
September	1650	1727	573
October	1571	2127	639
November	1452	2503	763
December	1269	1958	613
Annual	1109	1299	426

---

[1] Statistically derived from 1960-1978 period of record.

TABLE 7

AVERAGE DIVERSIONS
GRAND JUNCTION AREA

Structure	Average Diversions				Period, Days
	1,000,000 m^3	af	m^3/s	cfs	
Grand Valley Canal	306	248,263	16.7	591	210
Grand Valley Project					
Power	509	412,249	16.0	565	365
Irrigation	549	444,935	30.0	1059	210
Redlands Canal					
Power	580	470,103	18.2	644	365
Irrigation	22	18,059	1.2	43	210

to the irrigation and power portion of the major diversions affecting flows in this reach of the Colorado River.

To account for the variation in flow to be expected due to differences in tributary area and location of return flow for irrigation and power, adjustments in tributary area and return flow were made to the monthly seven-day low flow estimates for the downstream gauge near the state line. The monthly seven-day low flow estimates were expressed in cfs per square mile of tributary area, and area adjustments were made for each site by determining the difference in tributary area between the site and the downstream gauge. Irrigation return flow was assumed to be fifty percent of the average irrigation diversion. Analysis of irrigation diversions indicate a surprisingly constant amount diverted even during dry years. As an example, it was learned that during 1977, a relatively dry year, additional outside power was purchased in order to maintain the supply of irrigation water in the Redlands Project. A large amount of water is diverted to generate power for pumping a smaller amount of irrigation water to a higher elevation. The Orchard Mesa Project works on a similar principle. Irrigation return flow was assumed to be in proportion to the amount of irrigated acreage which is tributary to the river within designated stretches. The return flow for power development occurs as point inflow as does the Gunnison River. Tables 8a and 8b summarize the computations and give the estimated seven-day low flow to be expected once in ten years for the five sites of interest in this study area.

To check the validity of the estimated seven-day low flow values within this study area, additional area and return flow adjustments were made to obtain the estimated seven-day low flow value for the Colorado River gauge site at Cameo. This was compared with the seven-day low flow value obtained from the Pearson Log III analysis. A remarkably close agreement was achieved between the values derived from the two methods. Monthly differences were expressed as a percentage of the statistically-derived value for the Cameo gauge. The seven-day low flow estimates derived from the downstream gauge varied from 10.3 percent lower to 31.3 percent higher than the statistically derived values. The monthly percentages averaged 1.5 percent high. The months

TABLE 8a

SUMMARY OF ESTIMATED 7-DAY LOW FLOWS TO BE EXPECTED ONCE IN 10 YEARS FOR COLORADO RIVER
(m^3/s)

Month	Gauge near State Line	Sites						
		Number 9	Number 7	Number 5		Number 3		Number 1
				WR	NC	WR	NC	
January	53.0	50.9	50.8	50.6	34.6	50.6	34.6	34.1
February	56.6	54.4	54.3	54.0	36.5	54.0	36.5	37.0
March	55.4	53.2	53.1	52.9	36.0	52.8	36.0	36.1
April	55.0	43.5	42.5	39.1	28.6	38.2	28.0	16.8
May	73.4	61.2	60.2	56.6	37.1	55.7	36.5	34.2
June	101.2	87.9	86.8	83.1	45.3	82.2	44.7	60.5
July	44.3	33.2	32.3	28.8	22.4	28.0	21.8	12.0
August	39.4	28.5	27.5	24.1	19.8	23.2	19.0	6.9
September	48.9	37.6	36.7	33.2	25.5	32.3	25.0	12.9
October	60.2	48.5	47.5	44.0	34.0	43.2	33.4	21.7
November	70.9	68.1	68.0	67.7	42.2	67.6	42.2	49.1
December	55.5	53.3	53.2	52.9	36.0	52.9	36.0	35.2

Key: WR = Whole River
NC = North Channel only

TABLE 8b

SUMMARY OF ESTIMATED 7-DAY LOW FLOWS TO BE EXPECTED ONCE IN 10 YEARS FOR COLORADO RIVER (cfs)

Month	Gauge near State Line	Sites						
		Number 9	Number 7	Number 5		Number 3		Number 1
				WR	NC	WR	NC	
January	1873	1799	1795	1787	1220	1786	1220	1205
February	1999	1920	1916	1907	1290	1906	1290	1307
March	1956	1879	1875	1867	1270	1866	1270	1273
April	1942	1536	1502	1379	1010	1348	990	592
May	2592	2160	2125	1999	1310	1967	1290	1207
June	3574	3104	3066	2936	1600	2903	1580	2137
July	1564	1173	1140	1018	790	987	770	423
August	1390	1005	972	851	700	820	670	245
September	1727	1329	1295	1173	900	1142	880	454
October	2127	1713	1679	1555	1200	1524	1180	768
November	2503	2405	2400	2389	1490	2387	1490	1732
December	1958	1881	1877	1869	1270	1868	1270	1244

Key: WR = Whole River
NC = North Channel only

of greatest variation occur in April and October, which happen to correspond with the beginning and ending months of assumed irrigation. Figures 35 through 38 graphically illustrate the variation in estimated seven-day low flow values to be expected once in ten years for the Colorado River within the study reach.

For Stations 3 and 5, the study requires estimates of monthly seven-day low flow values for the portion of the flow which would be conveyed in the north channel only. Figure 1 shows the island which divides the river into north and south channels. On 13 March 1979, a river cross-section was obtained of the north channel, and for the period from 15 January 1979 to 26 September 1979, river height measurements were taken. A theoretical rating curve was derived for the north channel using the Manning formula for open-channel flow, estimated roughness coefficients and utilizing water surface slope as an estimate of energy gradient. The cross-section and rating curve are on Figures B.6 and B.7 of Appendix B. Utilizing the gauged flow data at the State Highway 340 Bridge near Fruita, estimates of inflow and return flow and the north channel rating curve, another curve was developed which relates the computed portion of flow in the north channel to the estimated flow in the river. This curve is shown in Figure B.8 in Appendix B. The data points define a smooth relationship for Colorado River flows above 68 m^3/s (2,400 cfs). The bottom portion of the curve was estimated without benefit of actual data. This curve was utilized along with the monthly estimates of seven-day low flow for the whole river to estimate the seven-day low flow values to be expected once in ten years for all of the sites of interest in this study.

ESTIMATED SEVEN DAY LOW FLOW PROFILES COLORADO RIVER

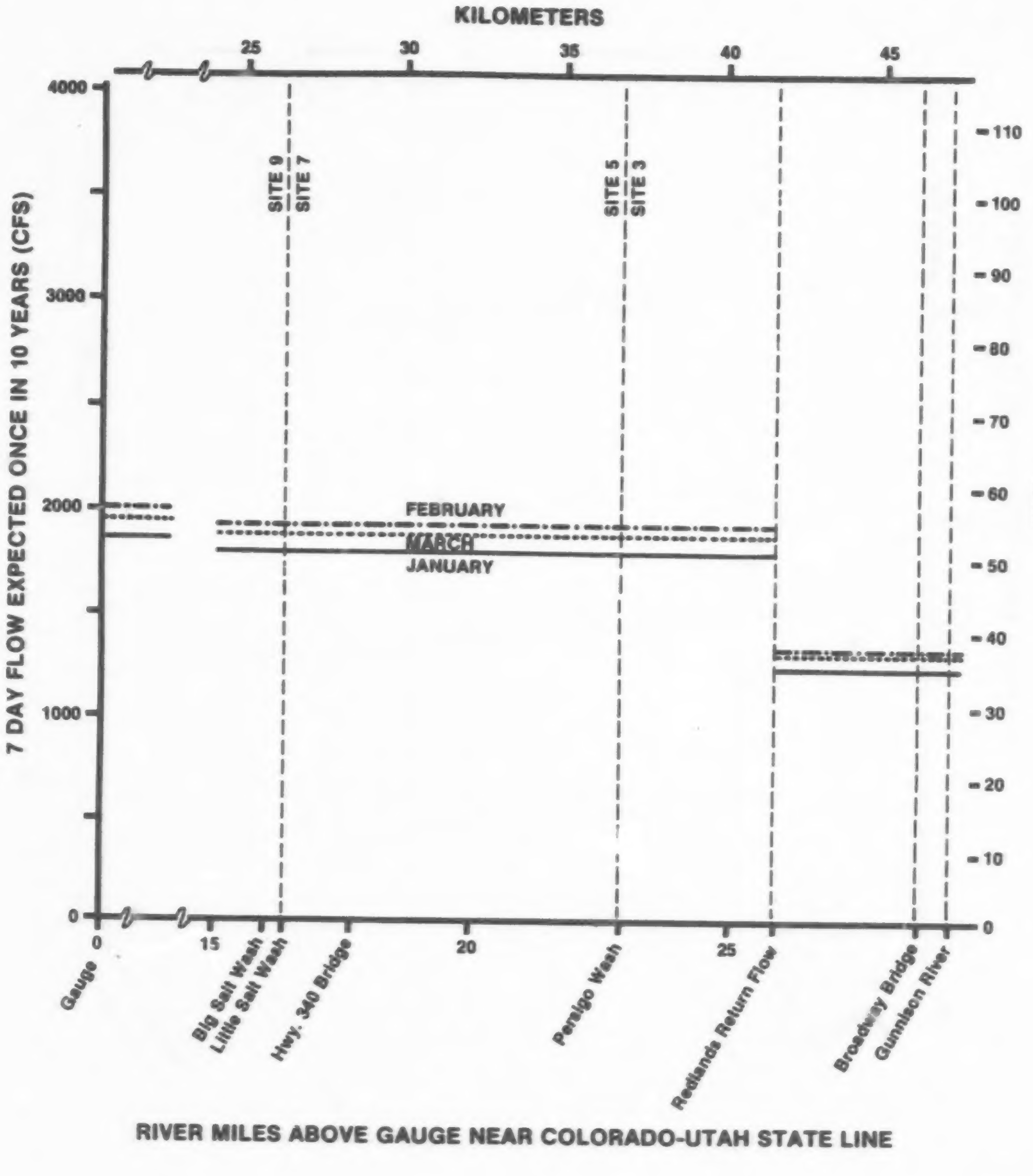
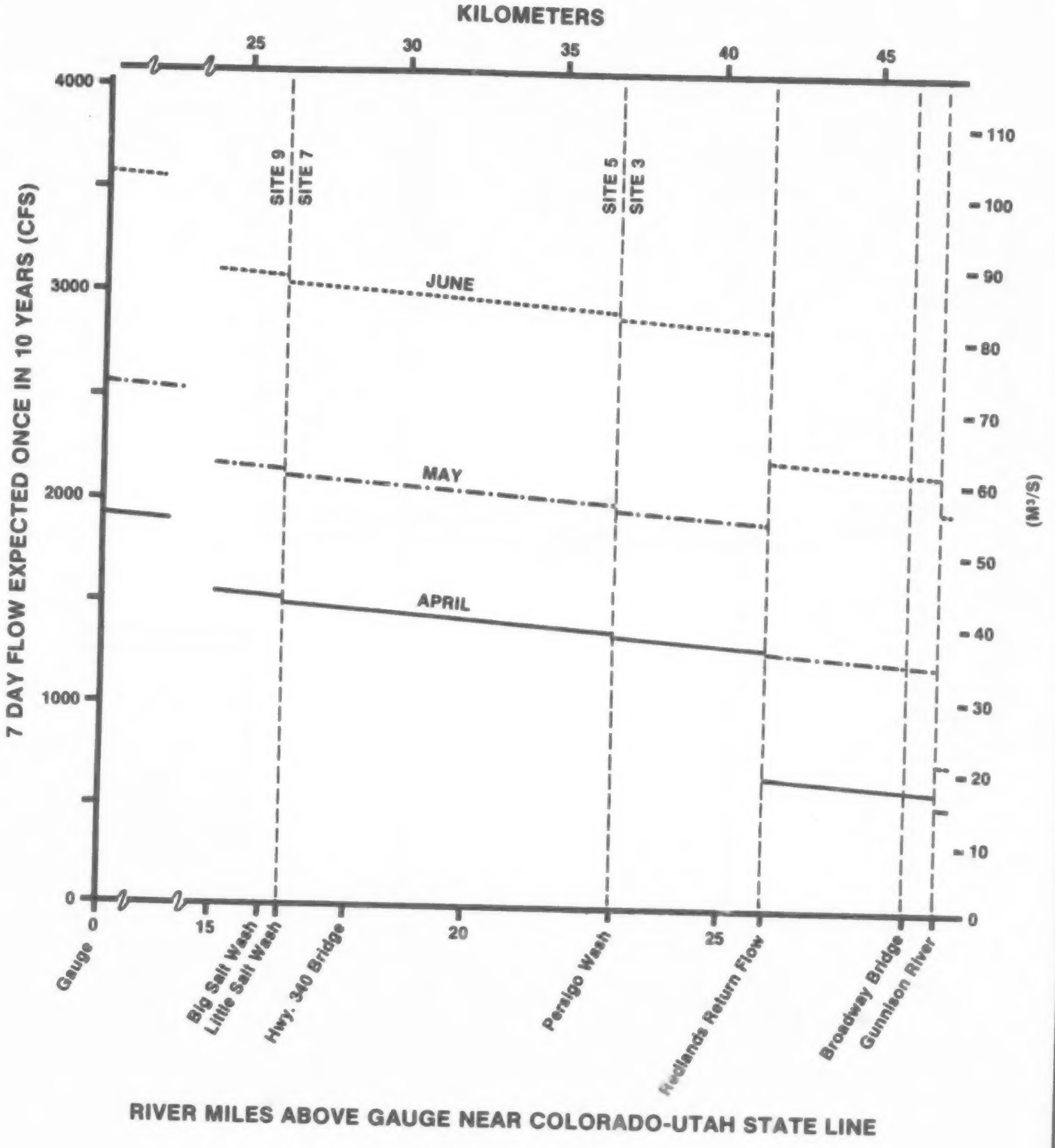


FIGURE 36

ESTIMATED SEVEN DAY LOW FLOW PROFILES
COLORADO RIVER



ESTIMATED SEVEN DAY LOW FLOW PROFILES COLORADO RIVER

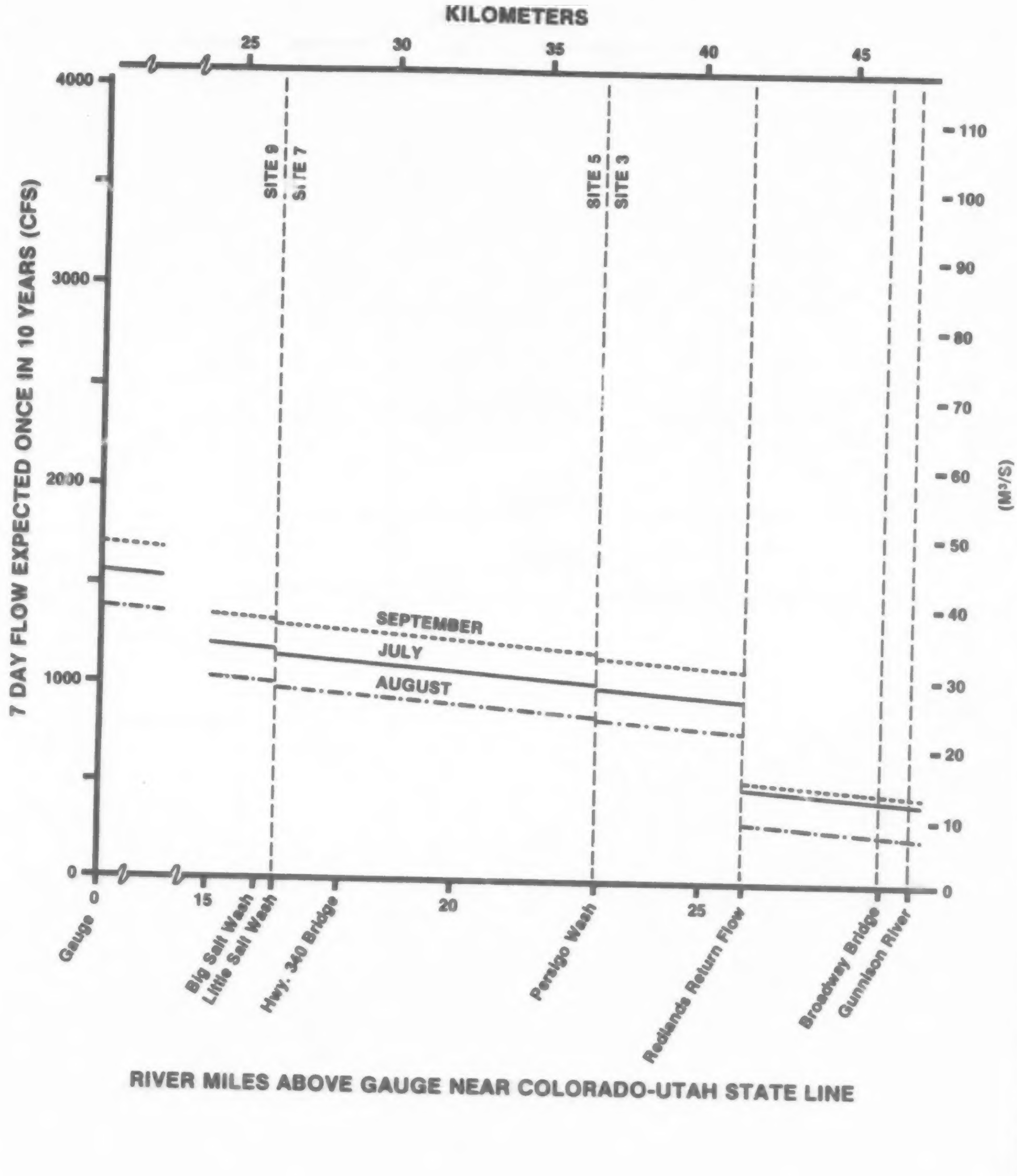
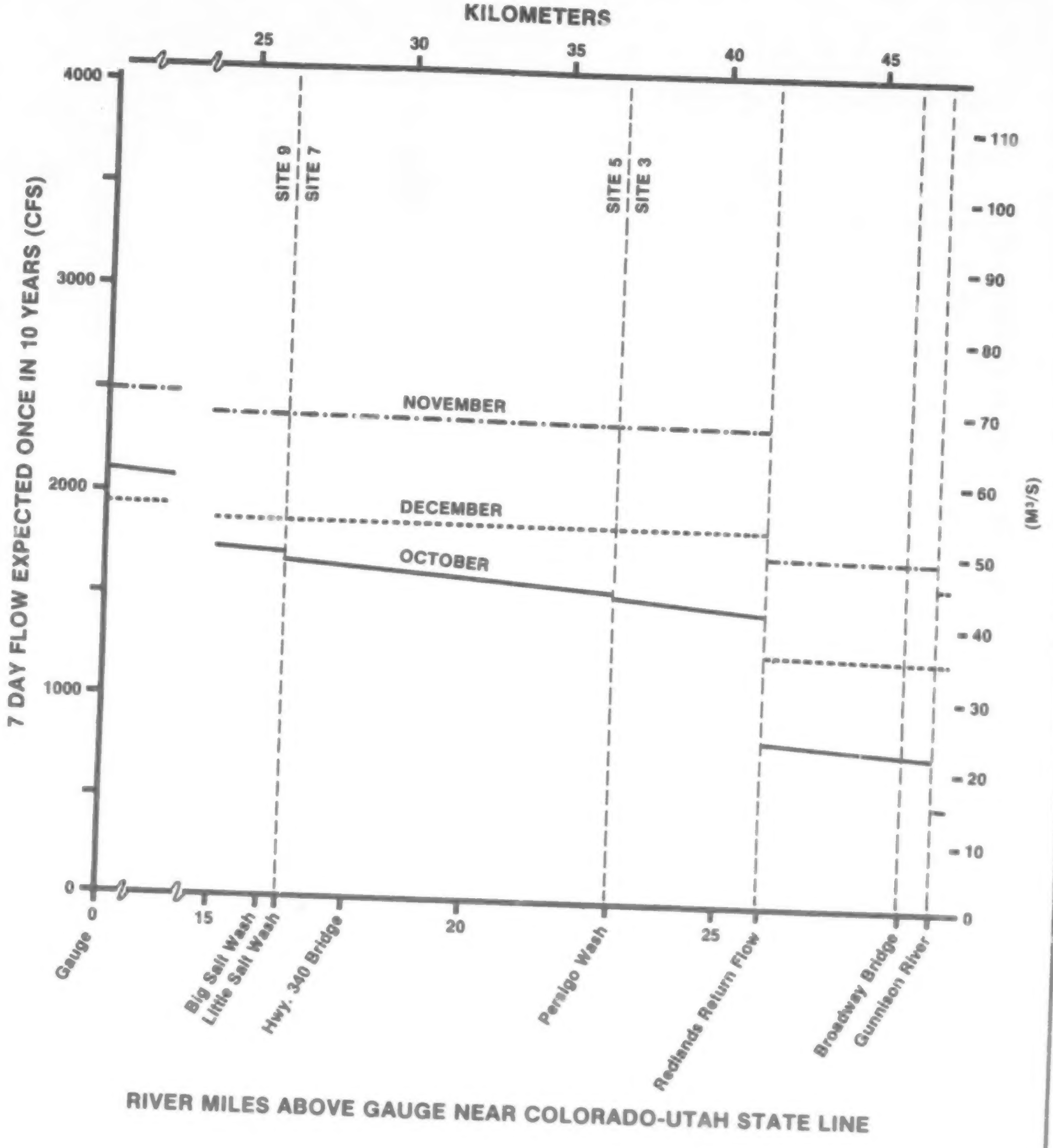


FIGURE 38

ESTIMATED SEVEN DAY LOW FLOW PROFILES
COLORADO RIVER



SECTION 5

AMMONIA LOADING ALLOCATIONS

SECTION 5

AMMONIA LOADING ALLOCATIONS

This section presents the conclusions and recommendations arising from the 13-month field survey described in earlier sections. These conclusions are based on the premise that to protect endangered and threatened fishes in the study area, un-ionized ammonia concentrations must not exceed 0.02 mg/ℓ, on the average. Wide background fluctuations of ammonia concentration were observed during the course of the study, including sporadically very high values far exceeding 0.02 mg/ℓ for brief periods. All instances where this criterion was exceeded are especially marked in the raw field data presented in Appendix A. The representative background values determined in Section 4 for temperature, pH, total ammonia and low flow were used to compute allowable loading of ammonia from the two treatment plants. A sample of the computation procedures used for these allocations is presented in Appendix C.

The summary of monthly representative background conditions and computed un-ionized ammonia under those conditions is presented in Table 9. For each month, a total ammonia concentration is computed that would be in equilibrium with the 0.02 mg/ℓ un-ionized ammonia limit. Subtracting this concentration from background ammonia concentration and multiplying this by the seven-day low flow to be expected once in ten years gives the maximum allowable discharge of ammonia from the treatment plants.

Calculations for the proposed Grand Junction treatment plant used the seven-day low flow to be expected once in ten years estimated for

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TABLE 9

REPRESENTATIVE MONTHLY BACKGROUND CONDITIONS IN THE COLORADO RIVER

Month	Temperature[a] °C	pH[a]	Background Total Ammonia[a] mg/ℓ	Flow[c] m^3/s			Maximum In-stream Total Ammonia[d] mg/ℓ
				Grand Junction		Fruita	
				Whole River	North Channel		
January	5[b]	8.2	0.18	50.6	34.6	50.9	1.03
February	5[b]	8.2	0.18	54.0	36.5	54.4	1.03
March	10	8.1	0.18	52.9	36.0	53.2	0.87
April	14	7.9	0.18	39.1	28.6	43.5	1.01
May	17	7.6	0.18	56.6	37.1	61.2	1.60
June	19	7.4	0.18	83.1	45.3	87.9	2.18
July	21	7.5	0.18	28.8	22.4	33.2	1.50
August	21	8.1	0.18	24.1	19.8	28.5	0.39
September	19	8.4	0.18	33.2	25.5	37.6	0.23
October	15	8.4	0.18	44.0	34.0	48.5	0.31
November	10	8.3	0.18	67.7	42.2	68.1	0.56
December	5[b]	8.1	0.18	52.9	36.0	53.3	1.29

[a] Determined graphically from Figures 36, 37, 38.

[b] Actual temperatures are less than 5°C; however, 5°C is the temperature at which percent un-ionized ammonia are calculated as discussed in Section 2.

[c] Estimated 7 day low flows to be expected once in 10 years in the Colorado River.

[d] Concentration of total ammonia at this temperature and pH which contains an un-ionized ammonia concentration of 0.02 mg/ℓ.

Station 5, the Colorado River downstream of Persigo Wash. In this reach, two islands divide the river into two nearly distinct channels, as shown in Figure 2. The allowable ammonia loading for low flow in the north channel (where Persigo Wash enters the river), as well as for low flow in the whole river, are shown in Tables 10a and 10b and Figure 39. The corresponding allowable ammonia concentrations in the wastewater discharge are computed based on the design flow of 47,000 m^3/d (12.5 mgd) and are shown in Table 11. Unless there is some mechanism for dispersing the effluent across the full width of the river, loading allocations for flows in the north channel provide the safest conditions for the endangered fishes.

For the Fruita discharge, flows for Station 9, the Colorado River downstream of Little Salt Wash, are used to calculate maximum allowable ammonia loadings and concentrations, which are independent of the allocations for Grand Junction. These quantities are also given in Tables 10a, 10b and 11 and Figure 39. Computations were made assuming the impact of the present Grand Junction discharges to be negligible on the background ammonia concentrations.

For comparison, approximate monthly ammonia loadings during 1978-79 from the two treatment plants are presented in Table 12. Ammonia discharges from the existing Grand Junction treatment plant were well within the calculated allowable loadings (assuming that dilution with the whole river is available) for all months except September, when discharges exceeded the allowable loadings by about 70 kg/day (150 lb/day). It is important to note that this is a conservative estimate since it is computed using an average daily flow based on flow during peak hours. In the Fruita treatment facility, ammonia discharges for all months were far below the allowable loading.

CONCLUSIONS AND RECOMMENDATIONS

Maximum allowable wasteload allocations for both treatment facilities vary dramatically, from highly restrictive quantities in the September low-flow period to fairly high quantities during the rest of the year. From these tabulations, it appears that discharge

TABLE 10a

MAXIMUM AMMONIA LOADING ALLOCATIONS TO THE COLORADO RIVER(a) (kg/day)

Month	Grand Junction Wastewater Treatment Facility Only(b)		Fruita Wastewater Treatment Facility Only(c)
	Whole River	North Channel	
January	3,700	2,500	3,700
February	4,000	2,700	4,000
March	3,200	2,100	3,200
April	2,800	2,100	3,100
May	6,900	4,600	7,500
June	14,400	7,800	15,200
July	3,300	2,600	3,800
August	440	360	520
September	140	110	160
October	500	380	550
November	2,200	1,400	2,200
December	5,100	3,400	5,100

(a) These allocations are the maximum loadings from either treatment facility that would result in an instream un-ionized ammonia concentration of 0.02 mg/ℓ. They are NOT recommended loadings; neither are they to be considered additive for Grand Junction and Fruita.

(b) Proposed wastewater treatment facility at Persigo Wash.

(c) Existing and proposed-to-be-expanded wastewater treatment facility at Little Salt Wash.

TABLE 10b

MAXIMUM AMMONIA LOADING ALLOCATIONS TO THE COLORADO RIVER(a)

(lb/day)

Month	Grand Junction Wastewater Treatment Facility Only(b)		Fruita Wastewater Treatment Facility Only(c)
	Whole River	North Channel	
January	8,200	5,500	8,200
February	8,800	6,000	8,800
March	7,100	4,600	7,100
April	6,200	4,600	6,800
May	15,200	10,100	16,500
June	31,800	17,200	33,500
July	7,300	5,700	8,400
August	970	790	1,100
September	310	240	350
October	1,100	840	1,200
November	4,900	3,100	4,900
December	11,200	7,500	1,100

(a) These allocations are the maximum loadings from either treatment facility that would result in an instream un-ionized ammonia concentration of 0.02 mg/ℓ. They are NOT recommended loadings; neither are they to be considered additive for Grand Junction and Fruita.

(b) Proposed wastewater treatment facility at Persigo Wash.

(c) Existing and proposed-to-be-expanded wastewater treatment facility at Little Salt Wash.

FIGURE 39

AMMONIA LOADING ALLOCATIONS TO THE COLORADO RIVER

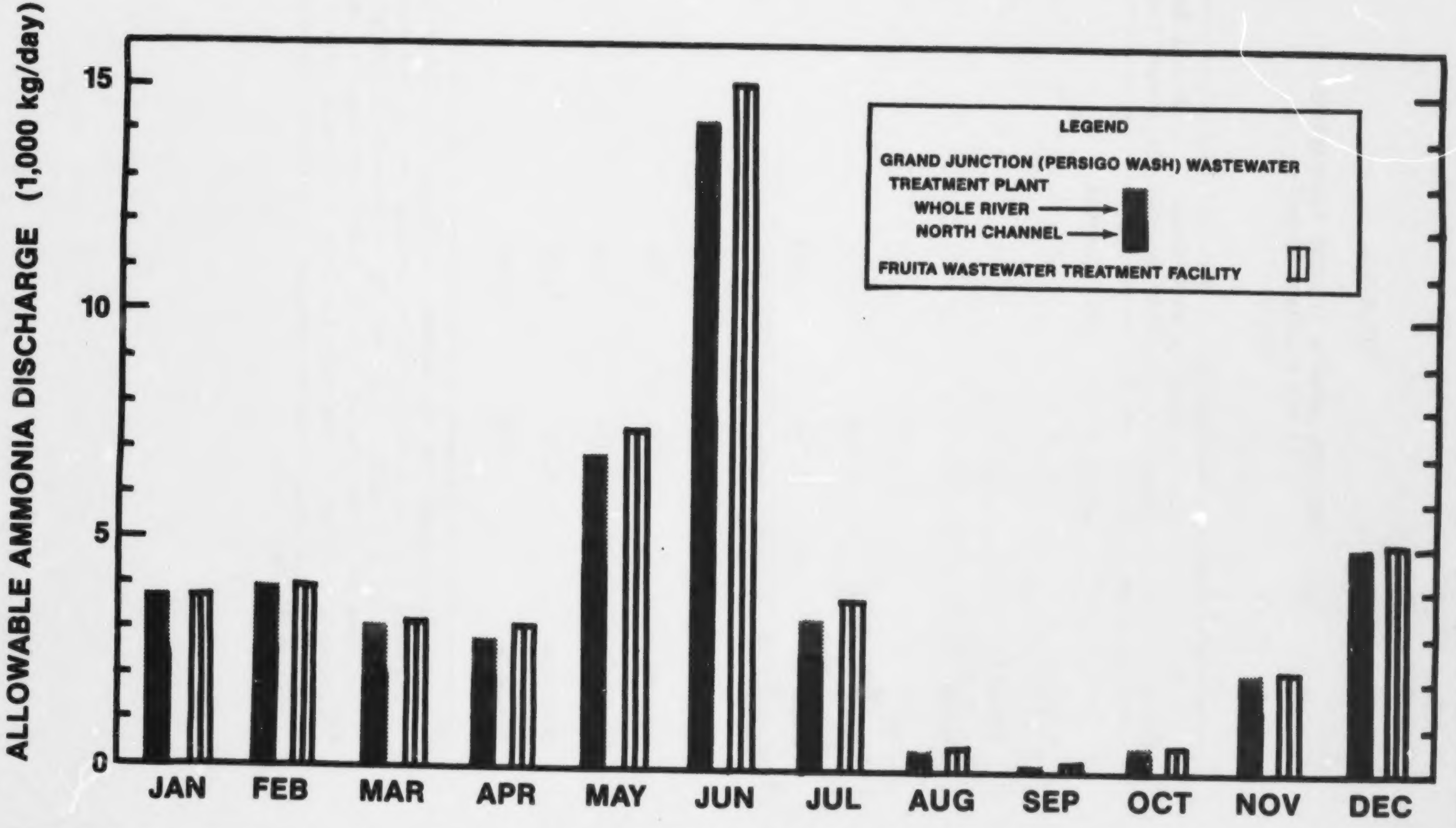

TABLE 11

MAXIMUM AMMONIA CONCENTRATION IN WASTEWATER DISCHARGED TO THE COLORADO RIVER

(mg/ℓ)

Month	Grand Junction Wastewater Treatment Facility Only*		Fruita Wastewater Treatment Facility Only*
	Whole River	North Channel	
January	78	53	782
February	85	57	845
March	68	44	676
April	59	44	655
May	146	97	1,585
June	304	165	3,213
July	70	55	803
August	10	8	110
September	3	2	34
October	11	8	116
November	46	30	465
December	108	72	1,078

---

*These concentrations correspond to the maximum ammonia loading allocations for the design flows of 47,000 m^3/d (12.5 mgd) for Grand Junction and 4,700 m^3/d (1.25 mgd) for Fruita. They are NOT recommended concentrations; neither are they to be considered additive for Grand Junction and Fruita.

TABLE 12

AMMONIA LOADINGS INTO COLORADO RIVER FROM GRAND JUNCTION AND FRUITA WASTEWATER TREATMENT FACILITIES IN 1978-79

	Grand Junction(a)		Fruita(b)	
Month	Total Ammonia Conc. (mg/ℓ)	Ammonia Load (kg/day)	Total Ammonia Conc. (mg/ℓ)	Ammonia Load (kg/day)
January	17.11	415	11.43	14
February	8.06	196	0.31	0.4
March	14.39	349	11.51	14
April	23.03	558	5.45	7
May	12.76	310	8.87	11
June	8.05	195	3.17	4
July	2.82	68	0.40	0.5
August	10.49	254	2.91	4
September	8.63	209	0.65	0.8
October	11.84	287	3.04	4
November	11.14	270	4.36	5
December	16.41	398	9.75	12
Average	12.06	292	5.15	6

(a) Average daily flow: 24,000 m^3/d (6.4 mgd) assumed constant throughout year.

(b) Average daily flow: 1,400 m^3/d (0.32 mgd) assumed constant throughout year.

allocations of ammonia should be made on a month-by-month basis. However, a generalized seasonal recommendation would be possible, if the most restrictive allocations were to be applied to the adjacent months. Thus, the seasonal allocations for Grand Junction would be: Summer (August through October), 110 kg/day (240 lb/day); Fall (November through January), 1,400 kg/day (3,100 lb/day); Winter (February through April), 2,100 kg/day (4,600 lb/day); and Spring (May through July), 2,600 kg/day (5,700 lb/day). For Fruita, the corresponding ammonia allocations would be: Summer, 160 kg/day (350 lb/day); Fall, 2,200 kg/day (4,900 lb/day); Winter, 3,100 kg/day (6,800 lb/day); and Spring, 3,800 kg/day (8,400 lb/day). It should be noted that these allocations for the two treatment facilities are the maximum loading from either facility that would result in an instream ammonia concentration of 0.02 mg/ℓ. They are not recommended loadings; neither are they to be considered additive for Grand Junction and Fruita.

Another recommendation, equally important to safeguard fish from the localized effects of discharge of the Grand Junction treatment plant effluent, is use of diffuser outfalls for quick dispersal of ammonia and its dilution across the whole river flowstream. Early in the study period, the dye tracer study demonstrated that the river water mixes rather slowly, and for long reaches, remains separated into varying dilution zones. Therefore, if the treatment plant effluent was wholly discharged into the northern channel of the river, it is possible that high concentrations of ammonia would prevail in a narrow band along the north bank, producing a potentially toxic zone for fish. Yet, nonetheless, the clear separation of the north channel from the rest of the river implies the existence of a "safe" zone of passage--not affected by the wastewater discharge--along the south channel.

FUTURE CONSIDERATIONS

It is conceivable that further studies such as fish bioassays and investigations of nonpoint source discharges will result in relaxation of the presently recommended criterion of 0.02 mg/ℓ un-ionized ammonia for freshwater aquatic life. The analysis and allocations presented in this report are wholly based on this criterion. If this standard should be relaxed in the future, it would result in a dramatic increase in allowable ammonia loadings to the river. For example, a revision of the criterion to 0.06 mg/ℓ un-ionized ammonia will result in loadings shown in Table 13. At these loadings, the wastewater treatment facilities would not require ammonia control at any time of the year. However, until further studies prove otherwise, there should be provisions for ammonia control during the critical months of the year to ensure year-round maximum protection of the threatened and endangered fishes.

TABLE 13

MAXIMUM AMMONIA LOADING TO THE COLORADO RIVER FOR 0.06 mg/ℓ STANDARD(a)

(kg/day)

Month	Grand Junction Wastewater Treatment Facility Only(b)		Fruita Wastewater Treatment Facility Only(c)
	Whole River	North Channel	
January	12,000	8,700	12,800
February	13,600	9,200	13,700
March	11,100	7,600	11,200
April	9,600	7,000	10,700
May	22,600	14,800	24,400
June	45,500	24,900	48,100
July	10,800	8,400	12,400
August	2,100	1,700	2,500
September	1,500	1,200	1,700
October	2,900	2,200	3,100
November	8,800	5,500	8,800
December	16,900	11,500	17,000

(a) These are the maximum loadings from either treatment facility that would result in an instream un-ionized ammonia concentration of 0.06 mg/ℓ. They are NOT recommended loadings; neither are they to be considered additive for Grand Junction and Fruita.

(b) Proposed wastewater treatment facility at Persigo Wash.

(c) Existing and proposed-to-be-expanded wastewater treatment facility at Little Salt Wash.

SECTION 6

REFERENCES

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SECTION 6

REFERENCES

Binder, Charles W., G. Bargsten, B. F. Marcuro, et al. Grand Valley Salinity Control Demonstration Project Basic Field Data. September 1968 to November 1976. Department of Agricultural and Chemical Engineering, Colorado State University, Fort Collins, Colorado. June 1978.

Colorado Department of Health, Water Quality Control Division. "Report on the Investigation of the Water Quality of the Colorado River, Dotsero, Colorado to Utah Border." Denver, Colorado. January 1976.

Colorado West Area Council of Governments. Colorado West Area Draft 208 Plan. Draft Main Report and Final Technical Appendices. Rifle, Colorado. December 1977.

Davis, E.M., T. D. Downs and W. G. Gray. "Ammonia in Texas Streams During Low Flow from Municipal Wastewater." Water Resources Bulletin, Vol. 14, No. 6. American Water Resources Association. December 1978.

Engineering-Science. Ammonia Toxicity Study in the Colorado River Near Grand Junction, Colorado. Preliminary Report. Berkeley, California. April 1979.

European Inland Fisheries Advisory Commission Working Party on Water Quality Criteria for European Freshwater Fish. "Water Quality Criteria for European Freshwater Fish," Water Research. Vol. 7 Pergamon Press 1973.

Henningson, Durham & Richardson. Grand Junction/Mesa County, Predesign Report for Wastewater Treatment Facilities and Interceptor Sewers. Denver, Colorado. August 1977.

Henningson, Durham & Richardson. Predesign Report Relating to Seasonal Ammonia Nitrogen Requirements Summary of Cost Evaluations. Supplements No. 1 and 2. Denver, Colorado. November and December 1977.

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Nelson, Haley, Patterson and Quirk, Inc. Water Quality Management Plan Colorado River Basin. Volumes 1, 2 and 3. Colorado Department of Health, Water Quality Control Division. Denver, Colorado. June 1975.

Nelson, Haley, Patterson and Quirk, Inc. Facilities Plan - City of Grand Junction, Colorado. Grand Junction, Colorado. August 1975.

Nelson, Haley, Patterson and Quirk, Inc. 201 Wastewater Treatment Facilities Plan for Town of Fruita, Colorado. Grand Junction, Colorado. September 1977.

U. S. Environmental Protection Agency. Quality Criteria for Water. Washington, D. C. July 1976.

U. S. Environmental Protection Agency, Technical Investigations Branch, 8S-TI. "Report of the Intensive Water Quality Study on the Colorado River Near the Grand Junction Sewage Treatment Plant, October 18-21, 1976." Denver, Colorado. November 1976.

U. S. Environmental Protection Agency Region VIII. "Negative Declaration, Proposed Wastewater Treatment Facility, Grand Junction, Colorado." Denver, Colorado. February 20, 1976.

U. S. Environmental Protection Agency Region VIII. "Negative Declaration, Wastewater Treatment Facility, Fruita, Colorado." Denver, Colorado. July 14, 1978.

U. S. Environmental Protection Agency Region VIII. "Amendment Negative Declaration, Wastewater Treatment Facility, Grand Junction, Colorado." Denver, Colorado. July 19, 1978.

Whittig, Lynn D. "Salinity Investigations in the West Salt Creek Watershed, Colorado." Project Proposal and Work Plan. Department of Land, Air and Water Resources, University of California, Davis. April 1979.

Willingham, William T. Ammonia Toxicity. Control Technology Branch, Water Division, U. S. Environmental Protection Agency, Region VIII. February 1976.

Willingham, W. T., J. E. Colt, J. A. Fava, et al. "Ammonia," in A Review of the EPA Red Book: Quality Criteria for Water. R. B. Thurston, et al. (Eds.) Water Quality Section, American Fisheries Societies. Bethesday, Maryland. 1979.

APPENDIX A

WEEKLY WATER QUALITY DATA

SUMMER INTENSIVE SURVEY

WEEK #1

DATE: 9/ 8/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1350	20.0	8.2	0.99	0.05845 **	0.06016 **
1B	1346	19.8	8.3	1.23	0.08937 **	0.09212 **
1C	1342	19.8	8.3	1.40	0.10128 **	0.10460 **
1D	1338	19.8	8.3	0.99	0.07149 **	0.07398 **
1E	1334	20.1	8.3	0.90	0.06688 **	0.06933 **
1F	1330	20.4	8.3	1.64	0.12410 **	0.12885 **
2	1300	22.9	7.4	8.06	0.09800 STP	
3A	1040	18.6	8.0	0.99	0.03414 **	0.03864 **
3B	1044	18.7	8.0	0.65	0.02264 **	0.02557 **
3C	1048	18.6	8.0	0.50	0.01736	0.01957
3A	1900	20.6	8.2	N/A	INSUFFICIENT DATA	
3B	1904	20.4	8.2	0.50	0.03054 **	0.03054 **
3C	1908	20.4	8.2	0.59	0.03605 **	0.03605 **
4	950	17.3	8.0	0.29	0.00907	0.01238
4	1845	21.4	8.1	0.50	0.02632 **	0.02632 **
5A	1010	17.8	7.9	0.65	0.01698	0.01933
5B	1012	17.9	8.0	0.38	0.01245	0.01413
5C	1015	18.3	8.0	0.53	0.01782	0.02017 **
5D	1017	18.4	8.0	0.43	0.01459	0.01647
5E	1020	18.4	8.0	0.38	0.01290	0.01453
5F	1022	18.5	8.0	0.39	0.01328	0.01492
5G	1025	18.6	8.0	0.29	0.00996	0.01116
5A	1830	20.8	8.1	0.43	0.02153 **	0.02255 **
5B	1833	21.1	8.1	N/A	INSUFFICIENT DATA	
5C	1836	21.0	8.1	1.56	0.07975 **	0.08354 **
5D	1839	20.9	8.1	0.55	0.02793 **	0.02926 **
5E	1842	20.9	8.1	1.89	0.09588 **	0.10044 **
5F	1845	20.8	8.1	0.38	0.01904	0.01995
5G	1848	20.7	8.2	0.99	0.06132 **	0.06420 **
6	830	19.7	9.9	0.99	0.74537 STP	
7A	800	18.4	8.0	N/A	INSUFFICIENT DATA	
7B	803	18.4	8.1	0.65	0.02765 **	0.03260 **
7C	806	18.5	8.1	0.43	0.01833	0.02158 **
7D	810	18.6	8.1	0.50	0.02166 **	0.02545 **
7A	1750	20.7	8.1	0.65	0.03248 **	0.03248 **

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

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WEEK #1 (Continued)

DATE: 9/ 8/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
7B	1754	20.6	8.1	0.81	0.04002 **	0.04002 **
7C	1758	20.7	8.0	0.53	0.02112 **	0.02112 **
7D	1802	20.7	8.1	0.53	0.02631 **	0.02631 **
8	830	17.5	8.1	0.50	0.02003 **	0.02501 **
8	1745	21.8	8.1	0.69	0.03725 **	0.03725 **
9A	815	18.1	8.1	0.99	0.04112 **	0.04911 **
9B	816	17.9	8.1	0.76	0.03108 **	0.03712 **
9C	817	18.2	8.0	0.76	0.02544 **	0.03040 **
9D	818	18.4	8.1	1.07	0.04551 **	0.05425 **
9E	819	18.4	8.1	0.70	0.02975 **	0.03546 **
9F	820	18.6	8.0	0.38	0.01309	0.01561
9A	1719	20.9	8.3	N/A	INSUFFICIENT DATA	
9B	1722	20.8	8.2	0.49	0.03036 **	0.03036 **
9C	1725	20.8	8.1	0.75	0.03767 **	0.03767 **
9D	1728	20.7	8.2	0.77	0.04803 **	0.04803 **
9E	1731	20.8	8.1	1.32	0.06624 **	0.06624 **
9F	1734	21.0	8.1	N/A	INSUFFICIENT DATA	
10A	1705	21.5	8.0	0.99	0.04187 **	0.04187 **
10B	1708	21.4	8.0	0.77	0.03257 **	0.03257 **
10C	1711	21.4	7.9	1.15	0.03887 **	0.03887 **
10D	1714	20.8	8.1	0.50	0.02525 **	0.02525 **
10E	1717	20.7	8.1	0.50	0.02508 **	0.02508 **

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #2

DATE: 9/19/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1245	14.6	8.3	0.38	0.01904	0.02028 **
1B	1248	14.6	8.0	0.25	0.00660	0.00703
1C	1251	15.0	8.5	0.28	0.02228 *	0.02361 *
1D	1255	14.9	8.5	0.25	0.02018 *	0.02134 *
1E	1258	15.0	8.5	0.19	0.01507	0.01592
1F	1301	N/A	N/A	N/A	INSUFFICIENT DATA	
2	1420	20.7	7.4	8.63	0.08973 STP	
3A	1500	14.6	8.3	0.30	0.01532	0.01524
3B	1505	14.6	8.5	0.28	0.02167 *	0.02151 *
3C	1510	14.6	8.5	0.25	0.01976	0.01976
4	1515	14.7	8.5	0.22	0.01733	0.01733
5A	1530	14.6	8.2	0.28	0.01130	0.01186
5B	1532	14.7	8.2	0.19	0.00770	0.00808
5C	1534	14.8	8.2	0.07	0.00270	0.00283
5D	1536	14.7	8.3	0.09	0.00459	0.00481
5E	1538	14.7	8.3	0.07	0.00334	0.00350
5F	1540	14.7	8.3	0.12	0.00584	0.00613
5G	1545	14.6	8.3	0.21	0.01076	0.01130
6	1850	14.8	8.8	0.35	0.05143 STP	
7A	1817	14.5	8.2	0.30	0.01220	0.01220
7B	1820	14.5	8.2	0.15	0.00594	0.00594
7C	1823	14.2	8.3	0.12	0.00563	0.00563
7D	1825	14.6	8.2	0.12	0.00465	0.00465
8	1845	14.1	8.2	0.14	0.00545	0.00545
9A	1855	14.4	8.3	0.16	0.00816	0.00816
9B	1858	14.3	8.3	0.16	0.00810	0.00810
9C	1900	14.3	8.3	0.16	0.00810	0.00810
9D	1902	14.2	8.4	0.14	0.00850	0.00850
9E	1904	14.4	8.5	0.16	0.01257	0.01257
9F	1906	14.4	8.3	0.16	0.00816	0.00816
10A	1910	14.0	8.0	0.14	0.00346	0.00346
10B	1912	14.1	7.9	0.14	0.00278	0.00278
10C	1914	14.1	7.9	0.14	0.00278	0.00278
10D	1916	14.3	8.5	0.04	0.00312	0.00312
10E	1917	14.4	8.4	0.21	0.01319	0.01319

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #3

DATE: 9/26/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1100	15.0	8.2	1.08	0.04481 **	0.05031 **
1B	1105	16.0	8.2	0.63	0.02794 **	0.03126 **
1C	1110	14.0	8.2	0.48	0.01845	0.02063 **
1D	1115	16.0	8.2	0.66	0.02941 **	0.03274 **
1E	1120	16.0	8.2	0.78	0.03493 **	0.03879 **
1F	1125	16.0	8.2	0.32	0.01434	0.01588
2	1135	22.0	7.9	9.79	0.34449 STP	
3A	1355	17.5	8.2	0.53	0.02619 **	0.02691 **
3B	1353	17.5	8.2	0.41	0.02046 **	0.02104 **
3C	1350	17.0	8.2	0.38	0.01817	0.01871
4	1245	16.0	8.2	0.42	0.01875	0.02154 **
5A	1250	16.5	8.2	0.39	0.01791	0.01799
5B	1253	16.5	8.2	0.39	0.01791	0.01800
5C	1255	16.5	8.2	0.50	0.02325 **	0.02337 **
5D	1257	16.5	8.1	0.73	0.02720 **	0.02736 **
5E	1300	16.5	8.2	0.26	0.01219	0.01227
5F	1310	16.5	8.2	0.18	0.00838	0.00845
5G	1320	17.0	8.2	0.26	0.01264	0.01276
6	1540	17.0	8.8	0.65	0.10864 STP	
7A	1525	18.0	8.2	0.26	0.01356	0.01356
7B	1530	18.0	8.2	0.44	0.02289 **	0.02289 **
7C	1535	18.0	8.2	0.15	0.00763	0.00763
7D	1537	N/A	N/A	N/A	INSUFFICIENT DATA	
8	1545	18.0	8.3	0.24	0.01527	0.01527
9A	1555	18.0	8.2	0.02	0.00127	0.00127
9B	1557	18.0	8.2	0.21	0.01102	0.01102
9C	1558	18.0	8.2	0.60	0.03094 **	0.03094 **
9D	1600	18.0	8.2	0.19	0.00975	0.00975
9E	1605	18.0	8.2	0.30	0.01568	0.01568
9F	1607	18.0	8.2	0.30	0.01568	0.01568
10A	1610	18.5	8.2	0.24	0.01273	0.01273
10B	1613	18.5	8.2	0.30	0.01624	0.01624
10C	1615	18.5	8.1	N/A	INSUFFICIENT DATA	
10D	1617	18.0	8.2	0.19	0.00975	0.00975
10E	1620	N/A	N/A	N/A	INSUFFICIENT DATA	

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #4

DATE: 10/ 3/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1805	16.5	8.3	0.63	0.03603 **	0.03603 **
1B	1808	16.5	8.3	0.55	0.03176 **	0.03176 **
1C	1815	15.5	8.2	0.67	0.02873 **	0.02873 **
1D	1820	15.5	8.3	0.33	0.01766	0.01766
1E	1825	16.0	8.3	0.06	0.00320	0.00320
1F	1830	16.0	8.3	0.06	0.00320	0.00320
2	1750	22.5	8.0	11.02	0.50087 STP	
3A	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
3B	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
3C	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
4	1420	15.0	8.1	0.25	0.00850	0.00889
5A	1425	15.0	8.2	0.17	0.00718	0.00734
5B	1430	15.0	8.3	0.11	0.00554	0.00567
5C	1435	15.0	8.4	0.13	0.00847	0.00867
5D	1440	15.0	8.4	0.17	0.01111	0.01139
5E	1442	15.0	8.5	0.06	0.00459	0.00470
5F	1445	15.0	8.5	0.03	0.00262	0.00269
5G	1450	15.0	8.4	0.02	0.00106	0.00109
6	1615	18.0	8.8	1.28	0.22816 STP	
7A	1555	16.5	8.3	0.02	0.00095	0.00095
7B	1600	16.0	8.3	0.02	0.00137	0.00137
7C	1610	16.0	8.3	0.02	0.00092	0.00092
7D	1650	16.0	8.3	0.02	0.00092	0.00092
8	1618	16.5	8.2	0.02	0.00076	0.00076
9A	1625	16.5	8.3	0.02	0.00095	0.00095
9B	1626	16.0	8.3	0.03	0.00183	0.00183
9C	1627	16.0	8.3	0.02	0.00092	0.00092
9D	1628	16.0	8.3	0.02	0.00137	0.00137
9E	1629	16.0	8.2	0.02	0.00074	0.00074
9F	1630	16.0	8.3	0.02	0.00137	0.00137
10A	1630	20.0	8.3	0.04	0.00302	0.00302
10B	1635	19.0	8.2	0.06	0.00318	0.00318
10C	1640	17.0	8.3	0.02	0.00147	0.00147
10D	1642	16.0	8.3	0.02	0.00092	0.00092
10E	1645	16.0	8.3	0.02	0.00092	0.00092

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #5

DATE: 10/12/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1440	14.5	8.3	0.26	0.01315	0.01322
1B	1448	14.5	8.4	0.22	0.01379	0.01381
1C	1508	14.5	8.4	0.28	0.01737	0.01737
1D	1502	15.0	8.5	0.17	0.01376	0.01368
1E	1500	15.0	8.5	0.12	0.00983	0.00978
1F	1456	14.5	8.4	0.12	0.00766	0.00764
2	1355	21.0	7.6	11.84	0.19806 STP	
3A	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
3B	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
3C	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
4	1545	15.5	8.2	0.17	0.00745	0.00745
5A	1520	15.0	8.3	0.10	0.00511	0.00537
5B	1523	15.0	8.3	0.17	0.00895	0.00939
5C	1525	15.0	8.4	0.13	0.00847	0.00888
5D	1527	15.5	8.5	0.16	0.01289	0.01351
5E	1530	15.5	8.6	0.17	0.01756	0.01838
5F	1532	15.5	8.6	0.17	0.01756	0.01838
5G	1535	15.5	8.7	0.16	0.02052 *	0.02145 *
6	1700	23.0	9.0	1.32	0.43753 STP	
7A	1650	16.0	8.6	0.13	0.01384	0.01384
7B	1652	16.0	8.6	0.12	0.01298	0.01298
7C	1654	16.0	8.6	0.12	0.01298	0.01298
7D	1655	16.0	8.5	0.12	0.01054	0.01054
8	1705	16.0	8.3	0.12	0.00686	0.00686
9A	1710	16.0	8.4	0.12	0.00852	0.00852
9B	1712	16.0	8.5	0.10	0.00843	0.00843
9C	1714	16.0	8.5	0.07	0.00632	0.00632
9D	1716	16.0	8.5	0.10	0.00843	0.00843
9E	1718	16.0	8.5	0.07	0.00562	0.00562
9F	1720	16.0	8.6	0.07	0.00779	0.00779
10A	1725	16.0	8.2	0.07	0.00331	0.00331
10B	1727	16.0	8.2	0.07	0.00331	0.00331
10C	1730	16.0	8.2	0.10	0.00441	0.00441
10D	1733	16.0	8.4	0.10	0.00681	0.00681
10E	1735	16.0	8.5	0.07	0.00632	0.00632

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #6

DATE: 10/20/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1210	11.0	8.3	0.42	0.01621	0.01762
1B	1212	11.0	8.4	0.35	0.01703	0.01848
1C	1235	12.0	8.5	0.35	0.02278 *	0.02438 *
1D	1240	11.5	8.5	0.38	0.02350 *	0.02510 *
1E	1242	12.0	8.5	0.41	0.02648 *	0.02825 *
1F	1245	12.0	8.5	0.42	0.02701 *	0.02877 *
2	1225	19.5	7.7	8.80	0.16570 STP	
3A	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
3B	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
3C	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
4	1200	11.5	8.5	0.25	0.01584	0.01905
5A	1120	11.0	8.5	0.22	0.01330	0.01414
5B	1125	11.0	8.5	0.25	0.01527	0.01615
5C	1130	11.5	8.5	0.22	0.01379	0.01451
5D	1135	11.5	8.5	0.19	0.01175	0.01230
5E	1140	11.5	8.6	0.22	0.01709	0.01779
5F	1145	12.0	8.6	0.17	0.01377	0.01427
5G	1150	11.5	8.5	0.22	0.01379	0.01423
6	930	12.0	8.5	4.52	0.29133 STP	
7A	920	11.0	8.4	0.22	0.01070	0.01231
7B	917	11.5	8.4	0.22	0.01110	0.01278
7C	915	11.0	8.4	0.22	0.01070	0.01233
7D	1005	12.0	8.5	0.11	0.00689	0.00776
8	933	10.5	8.4	0.17	0.00802	0.00971
9A	937	11.5	8.4	0.16	0.00781	0.00907
9B	939	11.0	8.4	0.13	0.00634	0.00736
9C	941	11.0	8.4	0.11	0.00515	0.00598
9D	942	11.0	8.5	0.35	0.02118 *	0.02452 *
9E	943	12.0	8.5	0.22	0.01430	0.01652
9F	945	11.5	8.5	0.19	0.01175	0.01357
10A	1000	11.0	8.4	0.27	0.01307	0.01505
10B	957	11.0	8.4	0.19	0.00911	0.01050
10C	955	10.0	8.4	0.13	0.00588	0.00680
10D	952	11.5	8.4	0.16	0.00781	0.00901
10E	950	12.0	8.4	0.22	0.01151	0.01329

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #7

DATE: 10/26/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1310	9.0	8.2	0.04	0.00109	0.00115
1B	1315	9.0	8.4	0.04	0.00171	0.00179
1C	1320	9.5	8.4	0.04	0.00177	0.00186
1D	1325	9.5	8.3	0.04	0.00142	0.00148
1E	1330	10.0	8.4	0.04	0.00184	0.00192
1F	1345	10.0	8.4	0.04	0.00184	0.00190
2	1300	18.5	7.7	12.99	0.22762 STP	
3A	1725	11.0	8.2	0.04	0.00127	0.00127
3B	1730	11.0	8.2	0.08	0.00254	0.00254
3C	1735	11.5	8.2	0.10	0.00317	0.00317
4	1738	11.5	8.2	0.06	0.00185	0.00185
5A	1740	11.5	8.2	0.30	0.00978	0.01028
5B	1743	11.5	8.2	0.04	0.00132	0.00139
5C	1745	11.5	8.2	0.04	0.00132	0.00139
5D	1747	11.0	8.2	0.04	0.00127	0.00134
5E	1750	11.0	8.2	0.04	0.00127	0.00134
5F	1755	11.0	8.3	0.04	0.00159	0.00167
5G	1800	11.5	8.3	0.04	0.00165	0.00173
6	1540	13.0	8.3	5.37	0.24065 STP	
7A	1530	10.5	8.3	0.04	0.00153	0.00153
7B	1532	10.0	8.3	0.04	0.00147	0.00147
7C	1535	11.0	8.3	0.04	0.00159	0.00159
7D	1620	11.0	8.3	0.04	0.00159	0.00159
8	1545	11.0	8.4	0.04	0.00198	0.00198
9A	1550	11.0	8.4	0.05	0.00238	0.00238
9B	1555	10.5	8.4	0.16	0.00725	0.00725
9C	1557	10.5	8.3	0.19	0.00704	0.00704
9D	1600	10.5	8.3	0.04	0.00153	0.00153
9E	1601	10.0	8.3	0.14	0.00501	0.00501
9F	1602	10.0	8.3	0.14	0.00501	0.00501
10A	1603	11.0	8.3	0.04	0.00159	0.00159
10B	1604	12.0	8.2	0.04	0.00137	0.00137
10C	1606	12.0	8.2	0.60	0.02002 **	0.02002 **
10D	1608	10.5	8.3	0.04	0.00153	0.00153
10E	1610	10.5	8.3	0.04	0.00153	0.00153

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #8

DATE: 10/30/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA, MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1130	9.5	8.3	0.21	0.00710	0.00789
1B	1135	9.0	8.3	0.14	0.00464	0.00515
1C	1740	9.7	8.3	0.29	0.01009	0.01009
1D	1730	9.6	8.4	0.90	0.03925 **	0.03925 **
1E	1725	9.5	8.4	0.31	0.01346	0.01346
1F	1720	9.5	8.4	0.53	0.02302 **	0.02302 **
2	1120	18.8	7.4	12.01	0.10870 STP	
3A	1450	9.8	8.4	0.07	0.00326	0.00326
3B	1454	9.4	8.4	0.30	0.01265	0.01263
3C	1456	9.4	8.4	0.13	0.00562	0.00561
4	1500	9.5	8.4	0.17	0.00744	0.00747
5A	1503	10.0	8.4	0.67	0.03015 **	0.03106 **
5B	1505	9.5	8.4	0.02	0.00071	0.00073
5C	1507	9.5	8.4	0.25	0.01098	0.01132
5D	1510	9.6	8.4	0.20	0.00856	0.00883
5E	1512	9.4	8.4	0.73	0.03128 **	0.03229 **
5F	1515	9.5	8.4	0.02	0.00071	0.00073
5G	1520	9.6	8.5	0.32	0.01732	0.01821
6	1615	11.3	8.6	3.04	0.23085 STP	
7A	1605	9.4	8.4	0.47	0.02003 **	0.02003 **
7B	1610	9.6	8.3	0.28	0.00972	0.00972
7C	1612	10.0	8.3	0.08	0.00295	0.00295
7D	1650	9.5	8.3	0.72	0.02498 **	0.02498 **
8	1618	9.6	8.3	0.16	0.00543	0.00543
9A	1620	9.8	8.4	1.64	0.07244 **	0.07244 **
9B	1622	9.5	8.4	0.07	0.00283	0.00283
9C	1625	9.4	8.4	0.04	0.00176	0.00176
9D	1627	9.4	8.5	0.21	0.01138	0.01138
9E	1630	9.5	8.5	0.07	0.00397	0.00397
9F	1632	9.5	8.5	0.04	0.00220	0.00220
10A	1634	10.4	8.2	0.99	0.02918 **	0.02918 **
10B	1635	10.4	8.2	1.15	0.03404 **	0.03404 **
10C	1636	10.4	8.2	1.23	0.03647 **	0.03647 **
10D	1638	9.4	8.5	0.07	0.00394	0.00394
10E	1640	9.5	8.4	0.04	0.00177	0.00177

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #9

DATE: 11/ 9/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1420	8.6	8.5	0.04	0.00206	0.00209
1B	1425	8.6	8.6	0.06	0.00359	0.00363
1C	1430	8.8	8.6	0.01	0.00052	0.00053
1D	1435	8.8	8.6	0.01	0.00052	0.00052
1E	1440	8.9	8.5	0.01	0.00042	0.00042
1F	1450	9.4	8.5	0.01	0.00044	0.00044
2	1340	17.8	7.5	11.27	0.11908 STP	
3A	830	7.8	8.4	0.03	0.00125	0.00152
3B	835	7.6	8.4	0.02	0.00061	0.00075
3C	840	7.6	8.4	0.04	0.00153	0.00186
4	845	7.8	8.3	0.04	0.00125	0.00186
5A	850	7.9	8.4	0.11	0.00408	0.00508
5B	853	7.9	8.4	0.04	0.00157	0.00195
5C	855	7.7	8.4	0.01	0.00031	0.00038
5D	859	7.5	8.5	0.02	0.00076	0.00094
5E	905	7.5	8.3	0.02	0.00049	0.00060
5F	907	7.5	8.3	0.01	0.00024	0.00030
5G	910	7.5	8.3	0.01	0.00024	0.00030
6	1550	9.4	8.6	4.44	0.29348 STP	
7A	1556	9.0	8.5	0.02	0.00085	0.00085
7B	1558	9.0	8.5	0.04	0.00212	0.00212
7C	1600	9.6	8.5	0.03	0.00178	0.00178
7D	1640	9.6	8.5	0.04	0.00222	0.00222
8	1605	9.4	8.5	0.04	0.00219	0.00219
9A	1607	9.4	8.3	0.02	0.00056	0.00056
9B	1610	8.9	8.5	0.01	0.00042	0.00042
9C	1612	8.9	8.5	0.01	0.00042	0.00042
9D	1615	8.8	8.5	0.02	0.00084	0.00084
9E	1620	8.9	8.5	0.02	0.00084	0.00084
9F	1623	8.8	8.5	0.02	0.00084	0.00084
10A	1625	11.9	8.1	0.01	0.00022	0.00022
10B	1626	11.2	8.2	0.01	0.00026	0.00026
10C	1627	9.9	8.3	0.01	0.00029	0.00029
10D	1628	8.6	8.5	0.02	0.00082	0.00082
10E	1630	8.7	8.5	0.01	0.00042	0.00042

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #10

DATE: 11/13/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1350	6.1	8.1	0.13	0.00223	0.00230
1B	1355	6.1	8.1	0.13	0.00223	0.00229
1C	1430	6.5	8.0	0.17	0.00240	0.00243
1D	1420	7.1	8.0	0.22	0.00324	0.00329
1E	1415	7.1	8.0	0.16	0.00228	0.00232
1F	1410	7.3	8.0	0.14	0.00207	0.00212
2	1330	15.9	7.4	11.76	0.08594 STP	
3A	1615	6.5	7.9	0.14	0.00155	0.00155
3B	1620	6.5	8.1	0.14	0.00244	0.00244
3C	1623	6.1	8.0	0.12	0.00166	0.00166
4	1630	7.7	8.0	0.13	0.00201	0.00201
5A	1633	6.8	8.0	0.12	0.00176	0.00185
5B	1635	6.8	8.0	0.07	0.00105	0.00111
5C	1637	6.7	8.0	0.09	0.00128	0.00135
5D	1640	6.7	8.0	0.10	0.00140	0.00147
5E	1641	6.7	8.1	0.10	0.00175	0.00185
5F	1643	6.6	8.0	0.12	0.00173	0.00183
5G	1645	6.7	7.9	0.07	0.00074	0.00078
6	1510	7.9	8.1	3.13	0.06089 STP	
7A	1508	6.9	8.0	0.06	0.00083	0.00082
7B	1504	6.9	8.0	0.07	0.00095	0.00094
7C	1500	7.0	8.0	0.06	0.00083	0.00083
7D	1550	7.5	8.0	0.12	0.00173	0.00173
8	1515	7.5	7.9	0.13	0.00158	0.00154
9A	1520	6.9	8.0	0.06	0.00083	0.00083
9B	1525	6.9	8.0	0.06	0.00083	0.00083
9C	1529	6.9	8.0	0.06	0.00083	0.00083
9D	1532	6.9	8.0	0.03	0.00047	0.00047
9E	1535	6.9	8.0	0.04	0.00059	0.00059
9F	1537	6.9	8.0	0.03	0.00047	0.00047
10A	1540	9.2	7.8	0.01	0.00009	0.00009
10B	1541	9.2	7.9	0.01	0.00011	0.00011
10C	1542	7.6	8.0	0.01	0.00012	0.00012
10D	1543	6.9	8.0	0.06	0.00083	0.00083
10E	1545	7.0	8.0	0.06	0.00083	0.00083

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #11

DATE: 11/20/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1400	5.6	8.4	0.25	0.00787	0.00809
1B	1405	5.9	8.4	0.19	0.00618	0.00633
1C	1410	4.8	8.4	0.21	0.00626	0.00630
1D	1413	4.8	8.5	0.21	0.00782	0.00786
1E	1417	5.0	8.5	0.29	0.01095	0.01115
1F	1420	5.1	8.5	0.26	0.01009	0.01025
2	1345	15.4	7.4	10.77	0.07584 STP	
3A	1445	5.1	8.4	0.21	0.00631	0.00633
3B	1447	5.1	8.4	0.26	0.00808	0.00809
3C	1448	5.3	8.4	0.26	0.00820	0.00821
4	1449	7.3	8.2	0.21	0.00479	0.00487
5A	1450	6.2	8.4	0.21	0.00688	0.00707
5B	1452	6.0	8.4	0.16	0.00542	0.00557
5C	1454	5.9	8.5	0.11	0.00436	0.00449
5D	1456	5.1	8.5	0.14	0.00536	0.00552
5E	1457	5.0	8.5	0.16	0.00626	0.00645
5F	1458	5.0	8.5	0.14	0.00532	0.00548
5G	1500	5.1	8.5	0.13	0.00504	0.00520
6	1550	5.7	8.4	4.85	0.15609 STP	
7A	1550	5.0	8.4	0.09	0.00275	0.00275
7B	1555	5.1	8.4	0.10	0.00303	0.00303
7C	1557	5.5	8.5	0.12	0.00488	0.00488
7D	1600	4.1	8.4	0.10	0.00300	0.00300
8	1605	7.4	8.1	0.10	0.00185	0.00185
9A	1610	5.0	8.5	0.07	0.00282	0.00282
9B	1612	4.9	8.5	0.07	0.00282	0.00282
9C	1614	4.9	8.5	0.03	0.00125	0.00125
9D	1616	4.9	8.4	0.04	0.00125	0.00125
9E	1618	4.9	8.4	0.11	0.00326	0.00326
9F	1620	4.7	8.4	0.16	0.00476	0.00476
10A	1621	9.1	8.0	0.07	0.00126	0.00126
10B	1622	7.8	8.1	0.21	0.00397	0.00397
10C	1623	7.1	8.2	0.03	0.00075	0.00075
10D	1624	4.9	8.4	0.03	0.00100	0.00100
10E	1625	4.9	8.4	0.12	0.00376	0.00376

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #12

DATE: 11/29/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1645	2.2	7.8	0.31	0.00245	0.00245
1B	1650	2.3	7.8	0.38	0.00296	0.00296
1C	1655	3.0	8.1	0.29	0.00446	0.00446
1D	1700	2.5	8.3	0.35	0.00841	0.00841
1E	1710	2.3	7.9	0.24	0.00235	0.00235
1F	1720	3.2	8.0	0.28	0.00345	0.00345
2	1355	15.0	7.5	11.02	0.09461 STP	
3A	1415	2.5	7.8	0.31	0.00245	0.00245
3B	1420	2.5	8.1	0.30	0.00472	0.00472
3C	1425	2.4	8.0	0.28	0.00345	0.00345
4	1440	3.9	8.0	0.35	0.00427	0.00427
5A	1445	2.6	7.9	0.28	0.00275	0.00275
5B	1448	2.8	8.2	0.23	0.00447	0.00447
5C	1450	2.6	7.9	0.21	0.00202	0.00202
5D	1453	2.2	7.8	0.25	0.00193	0.00193
5E	1456	2.5	8.1	0.34	0.00523	0.00523
5F	1459	2.5	8.2	0.21	0.00415	0.00415
5G	1500	2.3	8.1	0.26	0.00408	0.00408
6	1545	4.4	8.4	4.28	0.13022 STP	
7A	1550	2.5	7.8	0.34	0.00264	0.00264
7B	1553	2.6	7.8	0.25	0.00200	0.00200
7C	1555	2.5	7.9	0.29	0.00283	0.00283
7D	1557	2.4	7.8	0.29	0.00225	0.00225
8	1559	4.6	7.9	0.20	0.00194	0.00194
9A	1600	2.6	7.9	0.18	0.00178	0.00178
9B	1601	2.6	7.7	0.21	0.00128	0.00128
9C	1602	2.5	7.9	0.24	0.00235	0.00235
9D	1603	2.6	7.8	0.58	0.00457	0.00457
9E	1604	2.5	7.8	0.51	0.00399	0.00399
9F	1605	2.5	7.9	0.30	0.00291	0.00291
10A	1606	5.4	7.7	0.29	0.00185	0.00185
10B	1607	4.2	8.0	0.21	0.00264	0.00264
10C	1608	3.4	7.8	0.10	0.00077	0.00077
10D	1609	2.5	7.8	0.33	0.00257	0.00257
10E	1610	2.5	7.9	0.16	0.00154	0.00154

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #13

DATE: 12/ 4/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1325	1.9	7.5	0.15	0.00058	0.00058
1B	1327	1.4	7.7	0.07	0.00046	0.00046
1C	1330	1.9	8.0	0.07	0.00081	0.00081
1D	1335	1.7	7.7	0.08	0.00051	0.00051
1E	1340	1.7	8.0	0.26	0.00325	0.00325
1F	1345	2.4	8.0	0.16	0.00193	0.00193
2	1410	12.4	7.4	11.76	0.06595 STP	
3A	1413	1.3	8.0	0.20	0.00244	0.00244
3B	1415	1.3	7.6	0.13	0.00065	0.00065
3C	1417	1.3	7.9	0.13	0.00129	0.00129
4	1419	4.6	8.2	0.25	0.00479	0.00488
5A	1420	2.2	7.9	0.08	0.00081	0.00081
5B	1422	2.0	8.0	0.25	0.00315	0.00315
5C	1424	1.7	8.1	0.11	0.00166	0.00166
5D	1426	1.5	8.0	0.15	0.00183	0.00183
5E	1427	1.3	7.8	0.25	0.00193	0.00193
5F	1429	1.3	7.9	0.18	0.00178	0.00178
5G	1430	1.3	7.9	0.12	0.00113	0.00113
6	1515	3.3	8.2	4.69	0.09108 STP	
7A	1517	1.4	7.8	0.17	0.00135	0.00135
7B	1519	1.4	7.8	0.07	0.00051	0.00051
7C	1520	1.4	7.8	0.25	0.00200	0.00200
7D	1522	1.4	7.9	0.25	0.00243	0.00243
8	1524	4.2	8.0	0.25	0.00305	0.00305
9A	1526	1.5	7.9	0.22	0.00218	0.00218
9B	1528	1.4	8.0	0.25	0.00305	0.00305
9C	1530	1.4	7.7	0.20	0.00123	0.00123
9D	1531	1.4	7.9	0.30	0.00299	0.00299
9E	1532	1.4	8.1	0.25	0.00395	0.00395
9F	1533	1.4	7.8	0.21	0.00167	0.00167
10A	1535	6.4	7.7	0.25	0.00178	0.00177
10B	1537	5.3	7.6	0.25	0.00129	0.00129
10C	1538	3.9	7.6	0.08	0.00041	0.00041
10D	1539	1.5	7.7	0.25	0.00154	0.00154
10E	1540	1.3	7.7	0.22	0.00138	0.00138

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #14

DATE: 12/11/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	900	1.4	8.2	0.23	0.00447	0.00447
1B	910	0.4	8.2	0.12	0.00240	0.00240
1C	920	-0.1	8.2	0.16	0.00320	0.00320
1D	925	-0.1	8.1	0.23	0.00357	0.00357
1E	930	-0.1	8.0	0.18	0.00223	0.00223
1F	940	0.3	8.2	0.18	0.00352	0.00352
2	1345	12.2	7.6	17.11	0.14925 STP	
3A	1420	0.3	7.7	0.18	0.00113	0.00113
3B	1425	0.1	7.9	0.12	0.00113	0.00113
3C	1430	0.2	7.7	0.11	0.00067	0.00067
4	1437	0.3	8.0	0.27	0.00335	0.00335
5A	1440	N/A	N/A	N/A	INSUFFICIENT DATA	
5B	1444	0.6	7.9	0.15	0.00146	0.00146
5C	1448	0.2	7.7	0.18	0.00113	0.00113
5D	1450	0.9	7.7	0.29	0.00179	0.00179
5E	1454	1.0	7.8	0.17	0.00135	0.00135
5F	1456	0.8	7.8	0.15	0.00116	0.00116
5G	1500	0.5	7.7	0.12	0.00072	0.00072
6	1550	0.3	8.1	8.72	0.13509 STP	
7A	1552	0.9	7.7	0.14	0.00087	0.00087
7B	1554	0.0	7.8	0.07	0.00051	0.00051
7C	1556	-0.1	7.7	0.18	0.00113	0.00113
7D	1600	1.2	7.8	0.29	0.00225	0.00225
8	1551	0.1	7.8	0.17	0.00135	0.00135
9A	1605	N/A	N/A	N/A	INSUFFICIENT DATA	
9B	1608	0.7	7.8	0.07	0.00058	0.00058
9C	1610	0.2	7.8	0.20	0.00154	0.00154
9D	1612	0.1	7.8	0.23	0.00180	0.00180
9E	1615	0.0	8.1	0.14	0.00217	0.00217
9F	1618	0.0	8.1	0.08	0.00127	0.00127
10A	1620	0.5	7.9	0.09	0.00089	0.00089
10B	1623	0.2	7.8	0.16	0.00129	0.00129
10C	1625	0.2	7.8	0.14	0.00109	0.00109
10D	1630	0.0	7.7	0.11	0.00067	0.00067
10E	1635	-0.1	8.0	0.11	0.00132	0.00132

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #15

DATE: 12/18/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1330	0.8	7.4	0.35	0.00111	0.00111
1B	1335	0.8	7.4	0.21	0.00067	0.00067
1C	1340	0.3	7.2	0.24	0.00047	0.00047
1D	1350	N/A	N/A	N/A	INSUFFICIENT DATA	
1E	1400	0.8	7.4	0.25	0.00080	0.00080
1F	1420	3.0	7.2	0.21	0.00042	0.00042
2	1320	12.5	6.8	18.59	0.02650 STP	
3A	1445	0.4	7.4	0.21	0.00064	0.00064
3B	1448	0.4	7.3	0.21	0.00053	0.00053
3C	1450	0.3	7.4	0.25	0.00080	0.00080
4	1455	0.9	7.5	0.41	0.00162	0.00162
5A	1500	1.0	7.3	0.24	0.00059	0.00059
5B	1502	0.9	7.4	0.30	0.00095	0.00095
5C	1505	0.7	7.4	0.29	0.00090	0.00090
5D	1507	0.9	7.3	0.26	0.00065	0.00065
5E	1508	0.8	7.3	0.30	0.00076	0.00076
5F	1509	0.8	7.3	0.33	0.00082	0.00082
5G	1510	0.6	7.3	0.23	0.00057	0.00057
6	1610	1.2	7.1	10.77	0.01693 STP	
7A	1613	0.4	7.3	0.30	0.00074	0.00074
7B	1615	0.9	7.3	0.30	0.00074	0.00074
7C	1617	N/A	N/A	N/A	INSUFFICIENT DATA	
7D	1619	1.6	7.3	0.33	0.00082	0.00082
8	1620	0.4	7.3	0.39	0.00098	0.00098
9A	1622	N/A	N/A	N/A	INSUFFICIENT DATA	
9B	1625	N/A	N/A	N/A	INSUFFICIENT DATA	
9C	1629	0.3	7.3	0.21	0.00051	0.00051
9D	1630	0.3	7.3	0.21	0.00053	0.00053
9E	1632	0.1	7.3	0.31	0.00078	0.00078
9F	1635	0.1	7.4	0.25	0.00077	0.00077
10A	1637	5.4	7.4	0.35	0.00114	0.00114
10B	1640	2.4	7.5	0.33	0.00130	0.00130
10C	1643	1.3	7.5	0.25	0.00097	0.00097
10D	1644	0.3	7.3	0.25	0.00061	0.00061
10E	1645	0.2	7.4	0.21	0.00064	0.00064

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #16

DATE: 12/27/78

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1315	0.3	8.3	0.25	0.00621	0.00621
1B	1320	0.7	8.0	0.12	0.00152	0.00152
1C	1325	N/A	N/A	N/A	INSUFFICIENT DATA	
1D	1330	0.5	8.3	0.10	0.00240	0.00240
1E	1335	0.1	8.3	0.10	0.00240	0.00240
1F	1340	0.8	8.0	0.25	0.00315	0.00315
2	1310	10.3	7.3	15.71	0.05956 STP	
3A	1400	0.4	8.6	0.17	0.00819	0.00819
3B	1405	0.3	8.7	0.14	0.00824	0.00824
3C	1410	0.1	8.7	0.10	0.00582	0.00582
4	1418	0.9	8.6	0.22	0.01053	0.01053
5A	1428	0.0	8.7	0.10	0.00582	0.00582
5B	1432	0.0	8.5	0.10	0.00375	0.00375
5C	1436	-0.1	8.6	0.10	0.00468	0.00468
5D	1439	-0.1	8.7	0.12	0.00727	0.00727
5E	1442	-0.2	8.7	0.16	0.00921	0.00921
5F	1443	0.0	8.2	0.08	0.00160	0.00160
5G	1445	0.2	8.6	0.11	0.00507	0.00507
6	1510	0.3	8.1	10.77	0.16695 STP	
7A	1517	-0.1	8.4	0.19	0.00576	0.00576
7B	1519	-0.5	8.4	0.16	0.00476	0.00476
7C	1521	N/A	N/A	N/A	INSUFFICIENT DATA	
7D	1523	0.2	8.3	0.16	0.00380	0.00380
8	1527	0.9	8.3	0.22	0.00540	0.00540
9A	1532	0.9	8.5	0.19	0.00719	0.00719
9B	1534	0.0	8.5	0.22	0.00845	0.00845
9C	1536	0.0	8.4	0.17	0.00526	0.00526
9D	1538	0.0	8.4	0.20	0.00601	0.00601
9E	1539	-0.1	8.4	0.12	0.00376	0.00376
9F	1540	-0.1	8.5	0.07	0.00250	0.00250
10A	1544	2.4	8.3	0.17	0.00420	0.00420
10B	1546	1.5	8.3	0.27	0.00661	0.00661
10C	1548	0.2	8.2	0.10	0.00192	0.00192
10D	1549	0.0	8.2	0.08	0.00160	0.00160
10E	1550	-0.2	8.2	0.16	0.00304	0.00304

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #17

DATE: 1/ 1/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1340	0.7	7.8	0.12	0.00097	0.00097
1B	1345	0.0	8.0	0.12	0.00152	0.00152
1C	1350	0.1	7.9	0.27	0.00267	0.00267
1D	1355	0.0	7.6	0.44	0.00220	0.00220
1E	1400	-0.1	7.7	0.39	0.00241	0.00241
1F	1410	0.0	7.8	0.11	0.00084	0.00084
2	1330	7.4	7.3	17.43	0.05261 STP	
3A	1450	0.0	7.5	0.08	0.00032	0.00032
3B	1452	0.0	7.7	0.12	0.00077	0.00077
3C	1455	-0.1	7.7	0.12	0.00072	0.00072
4	1500	-0.2	7.7	0.12	0.00072	0.00072
5A	1510	-0.1	7.7	0.07	0.00041	0.00041
5B	1520	-0.1	7.7	0.11	0.00067	0.00067
5C	1525	-0.7	7.9	0.12	0.00121	0.00121
5D	1529	-0.1	7.9	0.16	0.00162	0.00162
5E	1534	-0.4	7.7	0.07	0.00046	0.00046
5F	1537	-0.2	7.9	0.11	0.00105	0.00105
5G	1540	-0.1	8.0	0.16	0.00203	0.00203
6	1600	-0.1	7.7	11.35	0.07067 STP	
7A	1605	-0.2	7.7	0.18	0.00113	0.00113
7B	1609	0.0	7.7	0.16	0.00102	0.00102
7C	1613	N/A	N/A	N/A	INSUFFICIENT DATA	
7D	1617	0.1	7.7	0.09	0.00056	0.00056
8	1622	N/A	N/A	N/A	INSUFFICIENT DATA	
9A	1626	0.0	7.7	0.05	0.00031	0.00031
9B	1630	0.0	8.0	0.03	0.00041	0.00041
9C	1635	0.0	7.7	0.01	0.00005	0.00005
9D	1639	-0.2	7.6	0.02	0.00012	0.00012
9E	1643	-0.2	7.9	0.08	0.00081	0.00081
9F	1648	-0.2	7.7	0.17	0.00108	0.00108
10A	1652	-0.1	7.7	0.22	0.00138	0.00138
10B	1656	-0.1	7.8	0.05	0.00039	0.00039
10C	1700	-0.1	8.0	0.11	0.00132	0.00132
10D	1705	-0.2	7.9	0.12	0.00121	0.00121
10E	1710	-0.2	7.9	0.08	0.00081	0.00081

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #18

DATE! 1/ 7/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1355	2.0	8.2	0.90	0.01758	0.01758
1B	1400	1.5	8.0	0.36	0.00447	0.00447
1C	1405	0.5	8.0	0.63	0.00772	0.00772
1D	1410	0.5	8.1	0.26	0.00408	0.00408
1E	1420	0.0	8.2	0.48	0.00927	0.00927
1F	1425	1.0	7.8	0.42	0.00328	0.00328
2	1345	8.0	7.4	17.11	0.06809 STP	
3A	1445	0.0	8.3	0.19	0.00460	0.00460
3B	1450	0.0	8.0	0.21	0.00254	0.00254
3C	1455	0.0	8.1	0.42	0.00650	0.00650
4	1500	0.0	8.1	0.39	0.00599	0.00599
5A	1502	0.0	8.2	0.39	0.00751	0.00751
5B	1504	0.0	8.2	0.39	0.00751	0.00751
5C	1506	0.0	8.1	0.39	0.00599	0.00599
5D	1508	0.0	8.2	0.25	0.00495	0.00495
5E	1510	0.0	8.0	0.14	0.00173	0.00173
5F	1515	0.0	8.1	0.22	0.00344	0.00344
5G	1520	0.0	8.2	0.29	0.00559	0.00559
6	1555	0.0	7.9	11.43	0.11241 STP	
7A	1600	0.0	8.1	0.49	0.00765	0.00765
7B	1603	0.0	8.1	0.49	0.00765	0.00765
7C	1606	N/A	N/A	N/A	INSUFFICIENT DATA	
7D	1610	0.0	8.2	0.58	0.01135	0.01135
8	1556	N/A	N/A	N/A	INSUFFICIENT DATA	
9A	1615	0.0	8.3	0.36	0.00881	0.00881
9B	1617	0.0	8.4	0.53	0.01603	0.01603
9C	1618	0.0	8.3	0.44	0.01081	0.01081
9D	1620	0.0	8.1	0.57	0.00879	0.00879
9E	1623	0.0	8.4	0.11	0.00326	0.00326
9F	1625	0.0	8.3	0.67	0.01621	0.01621
10A	1633	0.0	8.3	0.25	0.00621	0.00621
10B	1637	0.0	8.3	0.53	0.01281	0.01281
10C	1641	0.0	8.1	0.75	0.01160	0.01160
10D	1643	0.0	8.2	0.49	0.00943	0.00943
10E	1645	0.0	8.2	0.49	0.00943	0.00943

NOTE! * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #19

DATE: 1/17/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1350	1.9	7.9	0.12	0.00113	0.00113
1B	1355	1.5	7.8	0.14	0.00109	0.00109
1C	1400	1.4	7.9	0.07	0.00065	0.00065
1D	1405	1.5	7.8	0.06	0.00045	0.00045
1E	1410	1.3	7.7	0.07	0.00041	0.00041
1F	1415	0.9	7.8	0.07	0.00051	0.00051
2	1340	9.9	7.3	17.43	0.06407 STP	
3A	1435	0.8	7.9	0.16	0.00162	0.00162
3B	1440	1.0	7.8	0.11	0.00084	0.00084
3C	1445	1.1	7.7	0.11	0.00067	0.00067
4	1450	3.7	7.5	0.11	0.00042	0.00042
5A	1500	1.3	7.8	0.11	0.00084	0.00084
5B	1505	1.1	7.6	0.11	0.00053	0.00053
5C	1510	1.0	7.6	0.13	0.00065	0.00065
5D	1515	1.0	7.5	0.13	0.00052	0.00052
5E	1520	1.0	7.9	0.12	0.00113	0.00113
5F	1525	0.8	7.7	0.14	0.00087	0.00087
5G	1530	1.1	7.5	0.11	0.00042	0.00042
6	1615	1.5	7.4	18.91	0.05922 STP	
7A	1620	0.8	7.9	0.13	0.00129	0.00129
7B	1625	0.7	7.9	0.11	0.00105	0.00105
7C	1630	N/A	N/A	N/A	INSUFFICIENT DATA	
7D	1635	1.1	7.4	0.11	0.00033	0.00033
8	1640	3.3	7.9	0.28	0.00275	0.00275
9A	1645	1.3	7.9	0.15	0.00146	0.00146
9B	1650	0.8	7.9	0.14	0.00137	0.00137
9C	1655	0.7	7.9	0.13	0.00129	0.00129
9D	1700	0.7	7.9	0.12	0.00113	0.00113
9E	1703	0.7	7.9	0.12	0.00113	0.00113
9F	1705	0.7	7.9	0.12	0.00113	0.00113
10A	1707	3.1	7.7	0.11	0.00067	0.00067
10B	1710	1.4	7.9	0.11	0.00105	0.00105
10C	1715	1.0	7.9	0.15	0.00146	0.00146
10D	1718	0.8	7.9	0.11	0.00105	0.00105
10E	1720	0.8	7.9	0.12	0.00113	0.00113

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #20

DATE: 1/22/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1310	1.8	8.9	0.16	0.01486	0.01486
1B	1315	1.3	9.0	0.07	0.00731	0.00731
1C	1320	1.0	9.2	0.01	0.00136	0.00136
1D	1325	1.0	9.0	0.03	0.00366	0.00366
1E	1330	1.8	9.3	0.01	0.00164	0.00164
1F	1345	0.4	8.7	0.01	0.00048	0.00048
2	1300	9.6	8.5	16.69	0.90175 STP	
3A	1445	0.8	8.6	0.07	0.00312	0.00312
3B	1450	0.7	8.5	0.05	0.00188	0.00188
3C	1455	0.6	8.4	0.05	0.00150	0.00150
4	1500	2.0	8.4	0.08	0.00250	0.00250
5A	1503	1.1	8.6	0.12	0.00546	0.00546
5B	1505	1.1	8.3	0.05	0.00120	0.00120
5C	1508	1.0	8.3	0.06	0.00140	0.00140
5D	1510	0.4	8.5	0.05	0.00188	0.00188
5E	1512	0.4	8.2	0.09	0.00176	0.00176
5F	1515	0.9	8.5	0.02	0.00094	0.00094
5G	1520	0.6	8.5	0.11	0.00407	0.00407
6	1540	0.6	8.3	14.56	0.35429 STP	
7A	1545	0.8	9.3	0.03	0.00657	0.00657
7B	1550	0.9	9.2	0.03	0.00544	0.00544
7C	1555	0.9	9.2	0.01	0.00136	0.00136
7D	1600	0.4	9.1	0.02	0.00336	0.00336
8	1605	1.7	8.8	0.14	0.01022	0.01022
9A	1610	0.4	8.7	0.05	0.00291	0.00291
9B	1615	0.6	9.2	0.11	0.01768	0.01768
9C	1620	0.7	9.2	0.15	0.02448 *	0.02448 *
9D	1625	0.7	9.3	0.12	0.02299 *	0.02299 *
9E	1630	0.6	9.2	0.21	0.03400 *	0.03400 *
9F	1632	0.6	9.2	0.20	0.03264 *	0.03264 *
10A	1634	0.7	9.0	0.11	0.01188	0.01188
10B	1636	1.3	9.3	0.12	0.02299 *	0.02299 *
10C	1637	0.9	8.8	0.13	0.00962	0.00962
10D	1639	0.7	9.3	0.11	0.02135 *	0.02135 *
10E	1640	0.5	9.1	0.11	0.01454	0.01454

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #21

DATE: 1/27/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)		TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1315	1.5	7.7	0.34	0.00210		0.00210
1B	1320	0.8	7.9	0.14	0.00137		0.00137
1C	1325	0.1	7.6	0.17	0.00086		0.00086
1D	1330	0.1	7.6	0.16	0.00077		0.00077
1E	1335	0.1	7.5	0.18	0.00071		0.00071
1F	1340	0.1	7.8	0.39	0.00303		0.00303
2	1300	7.6	7.1	10.61	0.02054	STP	
3A	1355	0.6	7.5	0.17	0.00068		0.00068
3B	1357	0.5	7.5	0.07	0.00029		0.00029
3C	1400	0.5	7.2	0.07	0.00015		0.00015
4	1405	0.9	7.2	0.14	0.00028		0.00028
5A	1410	0.6	7.5	0.12	0.00045		0.00045
5B	1420	0.6	7.2	0.10	0.00020		0.00020
5C	1430	0.6	7.5	0.11	0.00042		0.00042
5D	1440	0.4	7.4	0.05	0.00015		0.00015
5E	1450	0.3	7.5	0.20	0.00078		0.00078
5F	1500	0.3	7.1	0.16	0.00025		0.00025
5G	1505	0.6	7.5	0.16	0.00062		0.00062
6	1530	0.7	7.2	7.84	0.01550	STP	
7A	1535	0.3	7.7	0.16	0.00097		0.00097
7B	1540	0.2	7.6	0.12	0.00057		0.00057
7C	1545	0.1	7.6	0.12	0.00057		0.00057
7D	1550	0.2	7.6	0.21	0.00102		0.00102
8	1555	0.1	7.6	0.16	0.00077		0.00077
9A	1600	0.0	7.7	0.14	0.00087		0.00087
9B	1603	0.2	7.8	0.21	0.00161		0.00161
9C	1606	0.2	7.7	0.16	0.00097		0.00097
9D	1609	0.2	7.7	0.16	0.00102		0.00102
9E	1612	0.3	7.7	0.23	0.00143		0.00143
9F	1614	0.4	7.7	0.09	0.00056		0.00056
10A	1615	0.9	7.7	0.21	0.00128		0.00128
10B	1616	0.2	7.7	0.12	0.00072		0.00072
10C	1618	0.2	7.7	0.05	0.00031		0.00031
10D	1619	0.3	7.7	0.14	0.00087		0.00087
10E	1620	0.1	7.6	0.12	0.00057		0.00057

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #22

DATE: 2/ 5/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1320	1.2	8.1	0.31	0.00484	0.00484
1B	1325	0.5	8.3	0.12	0.00280	0.00280
1C	1330	0.8	8.4	0.16	0.00476	0.00476
1D	1335	0.5	8.1	0.13	0.00204	0.00204
1E	1340	0.4	8.2	0.10	0.00192	0.00192
1F	1400	0.2	8.2	0.25	0.00479	0.00479
2	1310	7.8	7.7	8.21	0.06392 STP	
3A	1615	0.0	8.5	0.21	0.00782	0.00782
3B	1620	0.0	8.5	0.12	0.00438	0.00438
3C	1625	0.0	8.3	0.20	0.00480	0.00480
4	1630	0.0	8.3	0.12	0.00280	0.00280
5A	1640	-0.1	8.5	0.14	0.00532	0.00532
5B	1650	-0.1	8.5	0.14	0.00532	0.00532
5C	1700	-0.1	8.2	0.25	0.00479	0.00479
5D	1705	0.1	8.6	0.26	0.01248	0.01248
5E	1710	0.0	8.6	0.14	0.00663	0.00663
5F	1715	0.0	8.6	0.21	0.00975	0.00975
5G	1720	0.0	8.6	0.16	0.00780	0.00780
6	1500	-0.2	7.9	11.43	0.11241 STP	
7A	1505	0.1	8.4	0.12	0.00351	0.00351
7B	1510	0.1	8.5	0.18	0.00688	0.00688
7C	1515	0.1	8.5	0.21	0.00782	0.00782
7D	1520	-0.1	8.6	0.23	0.01092	0.01092
8	1525	-0.1	8.2	0.18	0.00352	0.00352
9A	N/A	N/A	N/A	N/A	INSUFFICIENT DATA	
9B	1527	0.0	8.5	0.27	0.01032	0.01032
9C	1529	0.1	8.4	0.21	0.00626	0.00626
9D	1531	0.3	8.3	0.14	0.00340	0.00340
9E	1533	0.3	8.1	0.18	0.00280	0.00280
9F	1535	0.3	8.6	0.17	0.00819	0.00819
10A	1540	1.5	8.4	0.23	0.00701	0.00701
10B	1541	0.6	8.5	0.23	0.00876	0.00876
10C	1542	0.0	8.5	0.18	0.00688	0.00688
10D	1543	0.1	8.6	0.23	0.01092	0.01092
10E	1545	0.0	8.5	0.17	0.00657	0.00657

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WINTER INTENSIVE SURVEY

WEEK #23

DATE: 2/15/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	810	0.0	6.8	0.12	0.00009	0.00009
1B	815	0.2	7.1	0.02	0.00003	0.00003
1C	820	2.3	7.1	0.07	0.00012	0.00012
1D	825	2.4	7.2	0.07	0.00015	0.00015
1E	830	2.3	7.2	0.05	0.00010	0.00010
1F	840	2.1	7.3	0.16	0.00039	0.00039
3A	920	1.3	7.4	0.11	0.00033	0.00033
3B	925	1.4	7.4	0.12	0.00036	0.00036
3C	930	1.4	7.3	0.12	0.00029	0.00029
4	935	1.2	7.1	0.34	0.00053	0.00057
5A	940	2.1	7.3	0.20	0.00049	0.00049
5B	942	1.6	7.4	0.18	0.00057	0.00057
5C	944	2.1	7.3	0.26	0.00065	0.00065
5D	946	1.3	7.4	0.12	0.00036	0.00036
5E	950	1.3	7.5	0.14	0.00055	0.00055
5F	955	1.4	7.5	0.09	0.00036	0.00036
5G	1000	1.5	7.5	0.14	0.00055	0.00055
3A	1035	1.8	7.4	0.09	0.00028	0.00028
3B	1040	2.2	7.7	0.07	0.00046	0.00046
3C	1045	2.3	7.7	0.07	0.00046	0.00046
4	1050	1.6	7.7	0.31	0.00195	0.00197
5A	1053	3.5	7.8	0.32	0.00251	0.00251
5B	1055	3.8	7.9	0.21	0.00202	0.00202
5C	1100	3.1	7.9	0.05	0.00049	0.00049
5D	1105	2.9	7.8	0.36	0.00283	0.00283
5E	1107	3.2	7.9	0.14	0.00137	0.00137
5F	1110	2.8	7.9	0.12	0.00113	0.00113
5G	1115	2.5	7.9	0.14	0.00137	0.00137
3A	1205	2.8	7.6	0.16	0.00077	0.00077
3B	1210	2.9	7.7	0.31	0.00195	0.00195
3C	1215	3.4	7.8	0.17	0.00135	0.00135
4	1220	4.0	7.8	0.14	0.00109	0.00121
5A	1223	4.3	7.9	0.31	0.00307	0.00307
5B	1225	4.1	8.0	0.14	0.00173	0.00173
5C	1230	4.1	7.9	0.21	0.00202	0.00202

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #23 (continued)

DATE: 2/15/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
5D	1235	3.7	7.9	0.14	0.00137	0.00137
5E	1237	3.8	7.9	0.05	0.00049	0.00049
5F	1240	3.9	8.0	0.13	0.00162	0.00162
5G	1242	3.2	8.0	0.12	0.00142	0.00142
2	1305	8.2	7.4	8.06	0.03259 STP	
3A	1335	3.3	8.0	0.12	0.00142	0.00142
3B	1340	3.5	8.0	0.14	0.00173	0.00173
3C	1345	3.6	8.0	0.12	0.00142	0.00142
4	1350	4.3	7.9	0.27	0.00267	0.00274
5A	1351	4.3	8.0	0.23	0.00284	0.00284
5B	1353	4.1	8.1	0.21	0.00319	0.00319
5C	1355	3.9	8.1	0.18	0.00280	0.00280
5D	1356	3.4	8.0	0.14	0.00173	0.00173
5E	1358	3.3	8.0	0.14	0.00173	0.00173
5F	1359	3.7	7.9	0.14	0.00137	0.00137
5G	1400	3.4	8.0	0.20	0.00244	0.00244
3A	1500	3.8	8.2	0.14	0.00272	0.00272
3B	1503	3.8	8.4	0.14	0.00426	0.00426
3C	1505	4.0	8.3	0.14	0.00340	0.00340
4	1507	5.7	8.3	0.36	0.00931	0.00931
5A	1510	4.3	8.3	0.12	0.00280	0.00280
5B	1515	4.1	8.3	0.18	0.00440	0.00440
5C	1517	3.9	8.2	0.18	0.00352	0.00352
5D	1520	3.4	8.2	0.18	0.00352	0.00352
5E	1523	3.1	8.3	0.05	0.00120	0.00120
5F	1525	3.5	8.2	0.14	0.00272	0.00272
5G	1530	3.0	8.4	0.02	0.00050	0.00050
3A	1640	3.8	8.1	0.02	0.00025	0.00025
3B	1643	3.8	8.3	0.25	0.00600	0.00600
3C	1645	3.8	8.2	0.20	0.00384	0.00384
4	1648	4.6	8.2	0.26	0.00511	0.00511
5A	1650	4.2	8.3	0.20	0.00480	0.00480
5B	1652	4.0	8.3	0.26	0.00641	0.00641
5C	1654	3.7	8.3	0.21	0.00500	0.00500
5D	1655	3.5	8.3	0.21	0.00500	0.00500

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #23 (continued)

DATE: 2/15/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
5E	1658	3.5	8.3	0.18	0.00440	0.00440
5F	1659	3.5	8.2	0.18	0.00352	0.00352
5G	1700	3.7	8.3	0.18	0.00440	0.00440
6	830	1.4	7.4	13.49	0.04223 STP	
7A	833	1.5	7.6	0.16	0.00081	0.00081
7B	835	1.6	7.6	0.16	0.00081	0.00081
7C	840	1.5	7.6	0.18	0.00090	0.00090
7D	845	1.7	7.7	0.20	0.00123	0.00123
8	850	0.3	7.9	0.38	0.00372	0.00372
9A	855	1.2	7.8	0.16	0.00129	0.00129
9B	900	1.5	7.7	0.25	0.00154	0.00154
9C	905	1.4	7.7	0.20	0.00123	0.00123
9D	910	1.5	7.7	0.20	0.00123	0.00123
9E	915	1.5	7.7	0.21	0.00128	0.00128
9F	917	1.5	7.7	0.22	0.00138	0.00138
10A	922	2.4	7.8	0.34	0.00264	0.00264
10B	924	2.2	7.8	0.22	0.00174	0.00174
10C	926	1.9	7.7	0.22	0.00138	0.00138
10D	928	1.5	7.7	0.21	0.00128	0.00128
10E	930	1.3	7.8	0.16	0.00129	0.00129
7A	1015	1.8	7.7	0.22	0.00138	0.00138
7B	1017	1.8	7.8	0.21	0.00161	0.00161
7C	1020	1.7	7.9	0.21	0.00202	0.00202
7D	1023	2.1	8.0	0.26	0.00325	0.00325
8	1025	2.4	8.0	0.44	0.00548	0.00548
9A	1030	1.8	7.8	0.21	0.00161	0.00161
9B	1035	1.9	7.9	0.25	0.00243	0.00243
9C	1040	2.0	7.9	0.23	0.00226	0.00226
9D	1045	2.0	8.0	0.21	0.00254	0.00254
9E	1050	2.0	7.9	0.22	0.00218	0.00218
9F	1055	2.0	7.9	0.23	0.00226	0.00226
7A	1150	2.5	7.7	0.23	0.00143	0.00143
7B	1154	2.5	7.6	0.16	0.00081	0.00081
7C	1156	2.5	7.7	0.16	0.00102	0.00102
7D	1200	2.6	7.8	0.14	0.00109	0.00109

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #23 (continued)

DATE: 2/15/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
8	1205	1.4	7.9	0.38	0.00372	0.00372
9A	1210	2.4	7.7	0.23	0.00143	0.00143
9B	1215	2.5	7.7	0.27	0.00169	0.00169
9C	1220	2.5	7.8	0.21	0.00161	0.00161
9D	1224	2.5	7.7	0.20	0.00123	0.00123
9E	1228	2.5	7.6	0.16	0.00081	0.00081
9F	1230	2.5	7.6	0.18	0.00090	0.00090
7A	1340	3.4	7.8	0.20	0.00154	0.00154
7B	1343	3.4	7.8	0.18	0.00142	0.00142
7C	1345	3.4	7.9	0.14	0.00137	0.00137
7D	1347	3.9	7.9	0.18	0.00178	0.00178
8	1350	4.2	8.2	0.65	0.01262	0.01262
9A	1352	3.7	8.0	0.18	0.00223	0.00223
9B	1356	3.2	8.0	0.18	0.00223	0.00223
9C	1400	3.1	8.0	0.18	0.00223	0.00223
9D	1403	3.0	8.0	0.16	0.00203	0.00203
9E	1407	3.3	8.0	0.09	0.00112	0.00112
9F	1410	3.3	8.1	0.16	0.00255	0.00255
7A	1515	3.7	8.0	0.20	0.00244	0.00244
7B	1517	3.6	7.9	0.18	0.00178	0.00178
7C	1520	3.6	7.9	0.26	0.00259	0.00259
7D	1523	3.6	8.0	0.21	0.00254	0.00254
8	1525	3.7	8.0	1.22	0.01503	0.01503
9A	1527	3.6	8.0	0.31	0.00386	0.00386
9B	1530	3.8	8.0	0.25	0.00305	0.00305
9C	1535	3.7	8.0	0.25	0.00305	0.00305
9D	1540	3.8	7.9	0.23	0.00226	0.00226
9E	1545	3.7	7.9	0.18	0.00178	0.00178
9F	1550	3.6	7.9	0.25	0.00243	0.00243
7A	1655	3.5	8.0	0.21	0.00254	0.00254
7B	1657	3.5	8.0	0.20	0.00244	0.00244
7C	1700	3.6	8.0	0.21	0.00254	0.00254
7D	1702	3.2	8.0	0.20	0.00244	0.00244
8	1705	2.8	8.0	1.12	0.01381	0.01381
9A	1707	3.5	8.1	0.25	0.00382	0.00382
9B	1709	3.6	8.1	0.27	0.00421	0.00421
9C	1712	3.6	8.0	0.23	0.00284	0.00284
9D	1713	3.6	8.0	0.23	0.00284	0.00284
9E	1714	3.5	8.0	0.25	0.00305	0.00305
9F	1715	3.5	7.9	0.35	0.00348	0.00348

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #24

DATE: 2/24/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1407	3.3	8.1	0.16	0.00255	0.00255
1B	1400	2.7	7.9	0.09	0.00089	0.00089
1C	1395	4.2	8.2	0.05	0.00096	0.00096
1D	1382	4.6	8.4	0.05	0.00150	0.00150
1E	1360	4.9	8.2	0.11	0.00208	0.00212
1F	1345	4.7	8.1	0.21	0.00331	0.00335
2	1330	10.5	7.4	7.89	0.03820 STP	
3A	1440	3.5	8.2	0.11	0.00208	0.00208
3B	1442	3.5	8.1	0.09	0.00140	0.00140
3C	1445	3.6	8.2	0.05	0.00096	0.00096
4	1448	5.0	8.2	0.09	0.00176	0.00179
5A	1500	3.8	8.3	0.31	0.00761	0.00761
5B	1501	3.7	8.1	0.27	0.00421	0.00421
5C	1502	3.1	8.3	0.17	0.00420	0.00420
5D	1504	3.4	8.1	0.21	0.00331	0.00331
5E	1506	3.3	8.2	0.15	0.00288	0.00288
5F	1508	3.4	8.2	0.16	0.00320	0.00320
5G	1510	3.5	8.2	0.06	0.00112	0.00112
6	1540	2.3	7.3	5.44	0.01355 STP	
7A	1545	3.7	8.3	0.15	0.00360	0.00360
7B	1547	3.8	8.4	0.16	0.00501	0.00501
7C	1548	3.7	8.2	0.08	0.00160	0.00160
7D	1550	3.2	8.3	0.07	0.00160	0.00160
8	1541	3.2	8.3	0.50	0.01221	0.01221
9A	1555	5.6	8.3	0.16	0.00420	0.00420
9B	1558	3.6	8.3	0.11	0.00260	0.00260
9C	1600	3.8	8.3	0.09	0.00220	0.00220
7D	1550	3.2	8.3	0.07	0.00160	0.00160
9E	1604	3.7	8.1	0.07	0.00102	0.00102
9F	1606	3.7	8.2	0.05	0.00096	0.00096
10A	1610	5.1	8.2	0.11	0.00209	0.00209
10B	1611	3.9	8.3	0.11	0.00260	0.00260
10C	1612	3.3	8.3	0.16	0.00400	0.00400
10D	1613	3.5	8.3	0.17	0.00420	0.00420
10E	1615	3.5	8.3	0.21	0.00520	0.00520

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #25

DATE: 3/ 1/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1220	2.3	8.5	0.09	0.00344	0.00344
1B	1225	3.3	8.4	0.16	0.00501	0.00501
1C	1230	4.7	8.4	0.05	0.00150	0.00158
1D	1234	5.0	8.4	0.12	0.00351	0.00378
1E	1237	5.0	8.4	0.01	0.00025	0.00027
1F	1240	5.1	8.5	0.11	0.00410	0.00440
2	1215	10.3	7.8	7.16	0.08518 STP	
3A	1255	3.3	8.4	0.12	0.00376	0.00376
3B	1257	3.4	8.5	0.18	0.00688	0.00688
3C	1259	3.5	8.1	0.09	0.00140	0.00140
4	1300	3.7	8.4	0.16	0.00501	0.00518
5A	1305	3.2	8.5	0.14	0.00532	0.00532
5B	1308	3.8	8.4	0.07	0.00200	0.00200
5C	1310	3.9	8.4	0.12	0.00376	0.00376
5D	1315	3.9	8.4	0.16	0.00501	0.00501
5E	1320	3.2	8.4	0.11	0.00326	0.00326
5F	1330	3.1	8.3	0.14	0.00340	0.00340
5G	1335	3.1	8.4	0.08	0.00250	0.00250
6	1355	2.3	7.5	8.88	0.03498 STP	
7A	1400	3.8	8.2	0.05	0.00096	0.00096
7B	1402	3.8	8.3	0.01	0.00020	0.00020
7C	1404	4.0	8.4	0.11	0.00326	0.00326
7D	1406	4.4	8.3	0.12	0.00280	0.00280
8	1409	5.2	8.3	0.99	0.02440 **	0.02483 **
9A	1410	3.8	8.3	0.06	0.00140	0.00140
9B	1412	3.8	8.2	0.03	0.00064	0.00064
9C	1414	3.8	8.2	0.12	0.00224	0.00224
9D	1416	3.9	8.3	0.11	0.00260	0.00260
9E	1417	3.8	8.2	0.07	0.00128	0.00128
9F	1418	3.7	8.3	0.07	0.00160	0.00160
10A	1420	5.2	8.2	0.12	0.00244	0.00251
10B	1424	4.5	8.2	0.09	0.00176	0.00176
10C	1427	4.4	8.3	0.11	0.00260	0.00260
10D	1430	3.8	8.1	0.05	0.00076	0.00076
10E	1435	3.7	8.3	0.11	0.00260	0.00260

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #26

DATE: 3/ 8/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1045	4.0	8.1	0.39	0.00612	0.00648
1B	1048	4.2	8.1	0.36	0.00561	0.00602
1C	1052	N/A	N/A	N/A	INSUFFICIENT DATA	
1D	1055	6.6	8.0	0.24	0.00335	0.00381
1E	1100	6.7	8.1	0.21	0.00365	0.00414
1F	1105	6.5	8.1	0.17	0.00301	0.00341
2	1035	12.3	7.3	6.91	0.03057 STP	
3A	820	3.5	8.1	0.21	0.00331	0.00365
3B	822	3.5	8.1	0.35	0.00535	0.00590
3C	825	3.8	8.0	0.30	0.00366	0.00412
4	835	2.3	7.8	0.81	0.00637	0.00793
5A	845	3.4	8.1	0.22	0.00344	0.00384
5B	847	3.5	8.0	0.51	0.00630	0.00707
5C	850	3.5	8.0	0.37	0.00457	0.00512
5D	855	3.7	8.1	0.30	0.00459	0.00519
5E	858	3.7	8.0	0.24	0.00295	0.00332
5F	900	3.5	8.1	0.28	0.00433	0.00480
5G	905	3.6	8.1	0.35	0.00535	0.00594
6	925	3.0	7.4	0.39	0.00121 STP	
7A	927	4.0	7.9	0.22	0.00218	0.00234
7B	929	4.1	7.9	0.21	0.00202	0.00218
7C	930	4.3	8.0	0.35	0.00427	0.00468
7D	932	4.2	8.0	0.16	0.00203	0.00221
8	937	2.1	8.0	0.58	0.00711	0.00711
9A	940	4.4	8.0	0.36	0.00447	0.00501
9B	942	4.1	8.0	0.22	0.00274	0.00300
9C	945	4.1	7.9	0.29	0.00283	0.00309
9D	947	4.3	8.1	0.43	0.00663	0.00735
9E	948	4.2	8.1	0.11	0.00166	0.00182
9F	950	4.1	7.9	0.21	0.00210	0.00229
10A	955	3.7	7.9	0.08	0.00081	0.00085
10B	955	4.4	8.0	0.23	0.00284	0.00317
10C	1000	4.4	8.0	0.21	0.00254	0.00282
10D	1005	4.1	7.9	0.35	0.00340	0.00368
10E	1010	4.1	8.0	0.14	0.00173	0.00186

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #27

DATE: 3/ 8/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1430	8.3	8.1	0.28	0.00562	0.00568
1B	1433	8.2	8.1	0.35	0.00689	0.00695
1C	1436	N/A	N/A	N/A	INSUFFICIENT DATA	
1D	1440	7.2	8.1	0.29	0.00531	0.00534
1E	1447	7.1	8.1	0.25	0.00452	0.00452
1F	1455	8.1	8.0	0.24	0.00376	0.00375
2	1345	12.3	7.2	23.03	0.08103 STP	
3A	1505	7.2	8.0	0.60	0.00883	0.00876
3B	1508	7.2	8.0	0.60	0.00883	0.00883
3C	1510	7.2	8.0	0.35	0.00508	0.00508
4	1515	9.9	8.1	0.33	0.00748	0.00748
5A	1520	7.7	8.1	0.30	0.00568	0.00599
5B	1525	7.5	8.0	0.33	0.00495	0.00522
5C	1528	7.5	8.1	0.36	0.00683	0.00720
5D	1530	8.3	8.0	0.21	0.00343	0.00361
5E	1535	8.1	8.0	0.30	0.00467	0.00493
5F	1540	8.0	8.1	0.18	0.00355	0.00374
5G	1545	8.0	8.1	0.21	0.00420	0.00443
6	1600	6.4	7.1	11.51	0.02026 STP	
7A	1605	7.1	7.9	0.29	0.00335	0.00335
7B	1607	7.0	8.0	0.23	0.00333	0.00333
7C	1610	7.2	8.0	0.13	0.00194	0.00194
7D	1615	7.2	8.0	0.21	0.00302	0.00302
8	1618	7.0	7.9	0.51	0.00588	0.00588
9A	1620	7.0	8.1	0.21	0.00373	0.00373
9B	1623	7.1	8.0	0.23	0.00336	0.00336
9C	1626	7.3	7.9	0.29	0.00340	0.00340
9D	1628	7.1	7.9	0.24	0.00277	0.00277
9E	1630	7.1	7.7	0.21	0.00158	0.00158
9F	1632	7.0	7.3	0.21	0.00062	0.00062
10A	1634	8.5	7.5	0.46	0.00240	0.00240
10B	1636	7.7	8.0	0.24	0.00365	0.00365
10C	1637	7.5	8.0	0.29	0.00433	0.00433
10D	1638	7.0	7.4	0.33	0.00121	0.00121
10E	1640	7.0	7.8	0.21	0.00189	0.00189

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #28

DATE: 3/19/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1420	8.2	7.9	0.30	0.00375	0.00382
1B	1425	8.2	7.8	0.39	0.00399	0.00404
1C	1428	7.4	7.8	0.26	0.00249	0.00253
1D	1435	7.4	7.9	0.26	0.00313	0.00316
1E	1440	7.4	7.8	0.31	0.00296	0.00298
1F	1445	7.9	7.8	0.41	0.00405	0.00407
2	1335	9.4	7.2	23.44	0.06584 STP	
3A	1500	7.4	7.9	0.23	0.00274	0.00273
3B	1505	7.5	7.9	0.13	0.00158	0.00157
3C	1508	8.3	8.0	0.25	0.00409	0.00409
4	1510	9.0	8.0	0.12	0.00209	0.00209
5A	1515	7.7	7.9	0.10	0.00120	0.00124
5B	1518	7.7	8.0	0.35	0.00528	0.00547
5C	1520	7.7	7.9	0.21	0.00251	0.00264
5D	1524	7.8	8.0	0.25	0.00380	0.00401
5E	1528	7.7	7.9	0.27	0.00331	0.00349
5F	1530	7.7	8.0	0.22	0.00340	0.00358
5G	1535	7.8	7.9	0.25	0.00303	0.00320
6	1605	8.4	7.4	13.82	0.05677 STP	
7A	1608	7.4	8.0	0.16	0.00246	0.00246
7B	1610	7.4	8.0	0.16	0.00246	0.00246
7C	1615	7.8	8.0	0.69	0.01065	0.01065
7D	1617	7.9	8.0	0.22	0.00345	0.00345
8	1620	8.1	8.1	0.22	0.00439	0.00439
9A	1622	7.7	8.0	0.18	0.00277	0.00277
9B	1625	7.7	8.0	0.21	0.00327	0.00327
9C	1627	7.6	7.9	N/A	INSUFFICIENT DATA	
9D	1630	7.6	7.9	0.16	0.00199	0.00199
9E	1632	7.5	7.5	0.16	0.00079	0.00079
9F	1635	7.5	7.9	0.21	0.00257	0.00257
10A	1637	8.3	7.8	0.06	0.00059	0.00059
10B	1640	7.9	7.9	0.06	0.00071	0.00071
10C	1643	7.8	8.0	0.06	0.00089	0.00089
10D	1646	7.4	7.9	0.06	0.00069	0.00069
10E	1650	7.5	7.9	0.11	0.00128	0.00128

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #29

DATE: 3/26/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1110	11.0	7.8	0.10	0.00124	0.00139
1B	1115	10.2	7.8	0.08	0.00097	0.00109
1C	1120	7.8	7.7	0.02	0.00019	0.00022
1D	1130	8.2	7.8	0.08	0.00083	0.00093
1E	1140	7.9	7.7	0.03	0.00026	0.00029
1F	1150	7.8	7.7	0.08	0.00064	0.00071
2	1100	11.7	6.8	14.39	0.01929 STP	
3A	820	7.5	7.8	0.21	0.00204	0.00253
3B	825	7.4	7.8	0.10	0.00094	0.00116
3C	830	7.4	7.8	0.10	0.00094	0.00115
4	833	7.5	7.8	0.08	0.00079	0.00120
5A	835	7.5	7.8	0.08	0.00079	0.00100
5B	840	7.2	7.8	0.10	0.00092	0.00117
5C	845	7.4	7.8	0.10	0.00094	0.00118
5D	850	7.3	7.8	0.02	0.00015	0.00019
5E	855	7.3	7.7	0.03	0.00025	0.00031
5F	900	7.3	7.8	0.07	0.00070	0.00087
5G	905	7.2	7.8	0.12	0.00115	0.00142
6	945	11.7	7.0	31.25	0.06633 STP	
7A	950	7.7	7.8	0.20	0.00192	0.00220
7B	955	7.8	7.8	0.03	0.00032	0.00037
7C	1000	8.0	7.6	0.18	0.00114	0.00130
7D	1005	8.0	7.5	0.10	0.00049	0.00056
8	1007	7.0	7.7	0.18	0.00132	0.00159
9A	1010	8.2	7.8	0.12	0.00116	0.00134
9B	1013	8.0	7.7	0.14	0.00111	0.00128
9C	1015	7.9	7.8	0.21	0.00211	0.00243
9D	1020	7.8	7.8	0.04	0.00040	0.00046
9E	1025	7.8	7.8	0.03	0.00032	0.00037
9F	1027	8.0	7.7	0.04	0.00033	0.00037
10A	1030	8.4	7.8	0.07	0.00067	0.00077
10B	1033	8.4	7.8	0.07	0.00067	0.00077
10C	1035	8.3	7.8	0.07	0.00067	0.00077
10D	1038	7.9	7.8	0.15	0.00146	0.00167
10E	1040	7.9	7.8	0.09	0.00089	0.00102

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #30

DATE: 4/ 2/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1410	7.8	8.0	0.23	0.00355	0.00363
1B	1412	8.4	7.9	0.19	0.00244	0.00249
1C	1415	7.3	7.8	0.08	0.00077	0.00079
1D	1420	6.5	7.7	0.23	0.00162	0.00164
1E	1430	6.4	7.8	0.07	0.00058	0.00058
1F	1435	6.6	7.7	0.12	0.00082	0.00082
2	1330	11.3	6.9	28.54	0.04667 STP	
3A	1455	6.5	7.6	0.23	0.00129	0.00128
3B	1457	6.4	7.7	0.12	0.00080	0.00080
3C	1500	6.6	7.7	0.10	0.00070	0.00069
4	1505	7.8	7.9	0.07	0.00091	0.00091
5A	1507	6.7	7.8	0.03	0.00030	0.00030
5B	1510	6.6	7.8	0.23	0.00205	0.00212
5C	1512	6.4	7.9	0.02	0.00018	0.00019
5D	1515	6.7	7.7	0.06	0.00041	0.00043
5E	1520	6.8	7.7	0.03	0.00024	0.00025
5F	1523	6.5	7.7	0.03	0.00023	0.00024
5G	1525	6.5	7.7	0.07	0.00046	0.00049
6	1550	8.6	7.2	5.45	0.01438 STP	
7A	1555	6.5	7.8	0.02	0.00015	0.00015
7B	1600	6.6	7.7	0.01	0.00006	0.00006
7C	1603	6.7	7.7	0.01	0.00006	0.00006
7D	1605	6.6	7.8	0.02	0.00015	0.00015
8	1607	8.2	7.9	0.16	0.00198	0.00198
9A	1609	6.4	7.8	0.02	0.00014	0.00014
9B	1610	6.5	7.8	0.01	0.00007	0.00007
9C	1612	6.4	7.8	0.07	0.00065	0.00065
9D	1615	6.3	7.8	0.01	0.00007	0.00007
9E	1617	6.2	7.8	0.06	0.00050	0.00050
9F	1618	6.2	7.8	0.01	0.00007	0.00007
10A	1620	7.5	7.8	0.02	0.00016	0.00016
10B	1622	7.6	7.8	0.12	0.00111	0.00111
10C	1625	6.5	7.8	0.11	0.00094	0.00094
10D	1628	6.4	7.8	0.07	0.00058	0.00058
10E	1630	6.1	7.8	0.06	0.00049	0.00049

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #31

DATE: 4/ 9/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1425	12.5	7.9	0.21	0.00363	0.00368
1B	1430	12.4	8.0	0.19	0.00415	0.00420
1C	1435	10.8	7.6	0.19	0.00148	0.00149
1D	1440	10.7	7.6	0.18	0.00141	0.00141
1E	1445	10.4	7.5	0.12	0.00070	0.00070
1F	1450	10.3	7.4	0.15	0.00071	0.00071
2	1320	14.8	6.9	11.92	0.02549 STP	
3A	1500	11.0	7.7	0.21	0.00206	0.00204
3B	1505	10.9	7.8	0.16	0.00205	0.00203
3C	1510	11.1	7.8	0.16	0.00208	0.00208
4	1512	12.2	8.0	0.16	0.00356	0.00356
5A	1515	11.2	7.7	0.21	0.00209	0.00216
5B	1517	11.1	7.6	0.20	0.00158	0.00164
5C	1520	11.1	7.6	0.20	0.00158	0.00167
5D	1523	11.5	7.7	0.16	0.00171	0.00180
5E	1525	11.5	7.8	0.22	0.00290	0.00305
5F	1530	11.3	7.8	0.16	0.00211	0.00222
5G	1535	11.2	7.9	0.16	0.00263	0.00277
6	1600	14.0	8.4	0.74	0.04436 STP	
7A	1603	11.0	7.9	0.28	0.00440	0.00440
7B	1605	11.0	7.9	0.13	0.00207	0.00207
7C	1608	11.2	7.8	0.13	0.00168	0.00168
7D	1610	10.9	7.6	0.13	0.00104	0.00104
8	1615	13.8	8.0	0.21	0.00501	0.00501
9A	1617	11.4	7.9	0.22	0.00361	0.00361
9B	1619	11.2	7.9	0.18	0.00289	0.00289
9C	1623	11.1	7.8	0.22	0.00281	0.00281
9D	1625	11.1	7.9	0.22	0.00352	0.00352
9E	1627	11.1	7.7	0.24	0.00240	0.00240
9F	1630	11.2	7.7	0.18	0.00184	0.00184
10A	1632	12.3	7.8	0.18	0.00251	0.00251
10B	1635	11.5	7.9	0.15	0.00242	0.00242
10C	1637	11.4	7.8	0.19	0.00245	0.00245
10D	1639	11.1	7.7	0.15	0.00149	0.00149
10E	1640	11.2	7.8	0.21	0.00262	0.00262

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #32

DATE: 4/19/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1325	12.5	7.8	0.31	0.00440	0.00460
1B	1330	12.3	7.6	0.21	0.00181	0.00189
1C	1335	11.0	7.4	0.14	0.00070	0.00073
1D	1340	N/A	N/A	N/A	INSUFFICIENT DATA	
1E	1345	N/A	N/A	N/A	INSUFFICIENT DATA	
1F	1350	11.5	7.6	0.11	0.00088	0.00091
2	1315	14.8	7.4	23.03	0.15496 STP	
3A	1410	11.5	7.7	0.43	0.00444	0.00454
3B	1412	11.4	7.6	0.12	0.00101	0.00103
3C	1415	11.5	7.7	0.24	0.00248	0.00252
4	1417	14.0	8.1	0.29	0.00891	0.00936
5A	1425	12.2	7.7	0.30	0.00324	0.00332
5B	1427	12.2	7.6	0.28	0.00244	0.00250
5C	1430	12.3	7.6	0.20	0.00174	0.00178
5D	1432	12.3	7.6	0.26	0.00231	0.00237
5E	1435	12.2	7.6	0.17	0.00151	0.00154
5F	1438	12.4	7.7	0.16	0.00183	0.00188
5G	1440	12.8	7.6	0.14	0.00128	0.00131
6	1505	14.4	9.0	11.10	2.30252 STP	
7A	1507	11.7	7.7	0.35	0.00364	0.00363
7B	1509	11.7	7.7	0.30	0.00312	0.00311
7C	1510	11.7	7.7	0.30	0.00312	0.00311
7D	1513	12.0	7.8	0.30	0.00412	0.00410
8	1515	16.6	8.1	0.42	0.01570	0.01531
9A	1518	11.9	7.8	0.33	0.00442	0.00445
9B	1520	11.9	7.8	0.28	0.00376	0.00378
9C	1522	11.9	7.8	0.28	0.00376	0.00377
9D	1524	11.8	7.7	0.22	0.00236	0.00237
9E	1526	11.6	7.7	0.14	0.00146	0.00147
9F	1528	11.6	7.7	0.13	0.00138	0.00138
10A	1529	12.0	7.7	0.28	0.00302	0.00302
10B	1530	11.9	7.7	0.21	0.00229	0.00229
10C	1532	12.0	7.7	0.10	0.00107	0.00106
10D	1534	11.8	7.7	0.17	0.00184	0.00183
10E	1535	11.6	7.7	0.29	0.00301	0.00301

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #33

DATE: 4/23/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1435	14.0	7.6	0.33	0.00329	0.00332
1B	1437	13.3	7.7	0.31	0.00372	0.00375
1C	1440	11.4	7.5	0.34	0.00220	0.00221
1D	1445	N/A	N/A	N/A	INSUFFICIENT DATA	
1E	1450	N/A	N/A	N/A	INSUFFICIENT DATA	
1F	1455	12.3	7.2	0.47	0.00165	0.00165
2	1255	15.9	7.0	5.26	0.01538 STP	
3A	1510	12.7	7.5	0.49	0.00350	0.00350
3B	1512	12.6	7.6	0.35	0.00318	0.00318
3C	1515	12.7	7.6	0.23	0.00209	0.00209
4	1517	15.7	7.5	0.08	0.00074	0.00074
5A	1520	13.9	7.4	0.32	0.00202	0.00212
5B	1523	13.9	7.3	0.31	0.00156	0.00164
5C	1526	13.4	7.5	0.25	0.00194	0.00204
5D	1530	13.4	7.4	0.32	0.00194	0.00204
5E	1533	13.4	7.5	0.12	0.00088	0.00092
5F	1537	14.0	7.5	0.33	0.00262	0.00276
5G	1540	12.8	7.4	0.30	0.00176	0.00185
6	1605	15.8	8.6	3.95	0.40968 STP	
7A	1607	12.7	7.5	0.13	0.00095	0.00095
7B	1608	12.7	7.6	0.07	0.00067	0.00067
7C	1610	12.8	7.6	0.13	0.00120	0.00120
7D	1613	12.9	7.4	0.16	0.00096	0.00096
8	1615	17.2	7.7	0.26	0.00419	0.00419
9A	1617	13.0	7.6	0.16	0.00145	0.00145
9B	1620	12.9	7.6	0.12	0.00106	0.00106
9C	1623	12.7	7.3	0.15	0.00068	0.00068
9D	1625	12.7	7.5	0.10	0.00071	0.00071
9E	1627	12.5	7.3	0.09	0.00041	0.00041
9F	1630	12.6	7.4	0.69	0.00393	0.00393
10A	1633	14.8	7.6	0.19	0.00201	0.00201
10B	1635	13.8	7.5	0.11	0.00084	0.00084
10C	1640	13.0	7.7	0.08	0.00096	0.00096
10D	1642	12.8	7.7	0.08	0.00094	0.00094
10E	1645	12.6	7.7	0.30	0.00344	0.00344

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #34

DATE: 4/30/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1430	17.1	7.6	0.41	0.00518	0.00524
1B	1440	16.5	7.7	0.41	0.00622	0.00625
1C	1445	15.9	7.6	0.35	0.00408	0.00409
1D	1310	13.3	7.5	0.27	0.00205	0.00216
1E	1320	13.9	7.5	N/A	INSUFFICIENT DATA	
1F	1330	15.7	7.5	1.02	0.00923	0.00962
2	1300	18.0	6.7	25.25	0.04331 STP	
3A	1500	13.1	7.5	1.18	0.00881	0.00876
3B	1503	12.9	7.5	0.55	0.00404	0.00401
3C	1505	13.3	7.6	0.35	0.00336	0.00333
4	1645	18.3	7.7	0.23	0.00398	0.00398
5A	1510	14.3	7.6	0.22	0.00227	0.00234
5B	1515	14.6	7.5	0.23	0.00192	0.00198
5C	1517	13.9	7.6	0.23	0.00229	0.00236
5D	1520	14.2	7.6	0.23	0.00234	0.00246
5E	1523	13.8	7.6	0.20	0.00194	0.00205
5F	1526	14.0	7.6	0.25	0.00247	0.00260
5G	1530	13.1	7.6	0.19	0.00177	0.00186
6	1545	16.6	8.7	10.28	1.37807 STP	
7A	1547	12.1	7.5	0.52	0.00357	0.00357
7B	1550	12.9	7.5	0.27	0.00199	0.00199
7C	1552	12.9	7.6	0.32	0.00295	0.00295
7D	1555	13.0	7.6	0.33	0.00305	0.00305
8	1558	17.8	7.6	0.31	0.00415	0.00415
9A	1600	13.7	7.6	0.25	0.00241	0.00241
9B	1602	13.6	7.6	0.29	0.00279	0.00279
9C	1605	13.4	7.5	0.25	0.00188	0.00188
9D	1608	13.3	7.6	0.30	0.00281	0.00281
9E	1610	13.1	7.6	0.23	0.00215	0.00215
9F	1612	13.1	7.6	0.31	0.00292	0.00292
10A	1614	15.8	7.5	0.25	0.00225	0.00225
10B	1616	13.3	7.6	0.27	0.00257	0.00257
10C	1617	12.9	7.6	0.27	0.00250	0.00250
10D	1618	13.0	7.5	0.29	0.00212	0.00212
10E	1620	12.9	7.6	0.21	0.00197	0.00197

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #34

DATE: 4/30/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1430	17.1	7.6	0.41	0.00518	0.00524
1B	1440	16.5	7.7	0.41	0.00622	0.00625
1C	1445	15.9	7.6	0.35	0.00408	0.00409
1D	1310	13.3	7.5	0.27	0.00205	0.00216
1E	1320	13.9	7.5	N/A	INSUFFICIENT DATA	
1F	1330	15.7	7.5	1.02	0.00923	0.00962
2	1300	18.0	6.7	25.25	0.04331 STP	
3A	1500	13.1	7.5	1.18	0.00881	0.00876
3B	1503	12.9	7.5	0.55	0.00404	0.00401
3C	1505	13.3	7.6	0.35	0.00336	0.00333
4	1645	18.3	7.7	0.23	0.00398	0.00398
5A	1510	14.3	7.6	0.22	0.00227	0.00234
5B	1515	14.6	7.5	0.23	0.00192	0.00198
5C	1517	13.9	7.6	0.23	0.00229	0.00236
5D	1520	14.2	7.6	0.23	0.00234	0.00246
5E	1523	13.8	7.6	0.20	0.00194	0.00205
5F	1526	14.0	7.6	0.25	0.00247	0.00260
5G	1530	13.1	7.6	0.19	0.00177	0.00186
6	1545	16.6	8.7	10.28	1.37807 STP	
7A	1547	12.1	7.5	0.52	0.00357	0.00357
7B	1550	12.9	7.5	0.27	0.00199	0.00199
7C	1552	12.9	7.6	0.32	0.00295	0.00295
7D	1555	13.0	7.6	0.33	0.00305	0.00305
8	1558	17.8	7.6	0.31	0.00415	0.00415
9A	1600	13.7	7.6	0.25	0.00241	0.00241
9B	1602	13.6	7.6	0.29	0.00279	0.00279
9C	1605	13.4	7.5	0.25	0.00188	0.00188
9D	1608	13.3	7.6	0.30	0.00281	0.00281
9E	1610	13.1	7.6	0.23	0.00215	0.00215
9F	1612	13.1	7.6	0.31	0.00292	0.00292
10A	1614	15.8	7.5	0.25	0.00225	0.00225
10B	1616	13.3	7.6	0.27	0.00257	0.00257
10C	1617	12.9	7.6	0.27	0.00250	0.00250
10D	1618	13.0	7.5	0.29	0.00212	0.00212
10E	1620	12.9	7.6	0.21	0.00197	0.00197

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #35

DATE: 5/ 8/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1430	11.0	7.8	0.24	0.00299	0.00303
1B	1435	11.2	7.8	0.19	0.00241	0.00243
1C	1445	10.1	7.5	0.30	0.00180	0.00180
1D	1325	10.6	7.5	0.19	0.00116	0.00122
1E	1335	10.1	7.6	0.24	0.00177	0.00184
1F	1340	10.0	7.6	0.14	0.00103	0.00107
2	1315	15.1	7.2	11.94	0.05199 STP	
3A	1510	10.5	7.6	0.19	0.00145	0.00145
3B	1512	10.3	7.6	0.21	0.00155	0.00155
3C	1515	10.3	7.8	0.20	0.00235	0.00235
4	1520	12.3	7.8	0.16	0.00228	0.00228
5A	1522	10.3	7.6	0.21	0.00161	0.00170
5B	1525	10.2	7.7	0.17	0.00162	0.00171
5C	1530	10.2	7.6	0.17	0.00129	0.00136
5D	1535	10.2	7.7	0.16	0.00147	0.00155
5E	1540	10.0	7.7	0.20	0.00183	0.00192
5F	1545	10.1	7.6	0.16	0.00116	0.00122
5G	1550	10.3	7.6	0.35	0.00267	0.00281
6	1610	13.8	8.5	5.82	0.42654 STP	
7A	1612	10.5	7.6	0.39	0.00296	0.00296
7B	1615	10.5	7.7	0.21	0.00198	0.00198
7C	1620	10.5	7.7	0.35	0.00340	0.00340
7D	1622	10.5	7.7	0.22	0.00214	0.00214
8	1625	10.9	7.7	0.18	0.00179	0.00179
9A	1627	10.5	7.6	0.12	0.00094	0.00094
9B	1630	10.5	7.6	0.07	0.00057	0.00057
9C	1632	10.5	7.6	0.15	0.00113	0.00113
9D	1634	10.5	7.7	0.12	0.00111	0.00111
9E	1636	10.4	7.7	0.16	0.00157	0.00157
9F	1640	10.5	7.6	0.12	0.00094	0.00094
10A	1643	10.8	7.8	0.16	0.00203	0.00203
10B	1646	10.5	7.7	0.21	0.00198	0.00198
10C	1650	10.4	7.7	0.14	0.00133	0.00133
10D	1652	10.4	7.7	0.12	0.00110	0.00110
10E	1655	10.4	7.6	0.16	0.00119	0.00119

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #36

DATE: 5/13/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1300	15.9	7.7	0.13	0.00190	0.00202
1B	1305	14.2	7.7	0.15	0.00189	0.00199
1C	1310	12.6	7.5	0.17	0.00124	0.00130
1D	1320	12.5	7.6	0.12	0.00103	0.00108
1E	1325	12.6	7.7	0.17	0.00195	0.00204
1F	1330	12.8	7.7	0.26	0.00302	0.00315
2	1250	17.4	7.2	16.20	0.08376 STP	
3A	1345	13.4	7.8	0.16	0.00235	0.00244
3B	1347	12.9	7.7	0.11	0.00124	0.00128
3C	1350	12.8	7.7	0.12	0.00142	0.00146
4	1355	16.1	7.9	0.12	0.00266	0.00285
5A	1400	14.4	7.7	0.28	0.00362	0.00369
5B	1405	14.4	7.8	0.24	0.00387	0.00395
5C	1410	14.0	7.8	0.16	0.00259	0.00264
5D	1415	14.1	7.8	0.18	0.00287	0.00293
5E	1420	14.0	7.7	0.17	0.00217	0.00222
5F	1425	14.0	7.6	0.13	0.00132	0.00135
5G	1430	13.2	7.8	0.14	0.00207	0.00212
6	1445	18.3	7.9	11.92	0.32304 STP	
7A	1450	13.4	7.8	0.14	0.00211	0.00211
7B	1455	13.4	7.8	0.16	0.00248	0.00248
7C	1458	13.5	7.8	0.18	0.00275	0.00275
7D	1459	13.6	7.8	0.16	0.00252	0.00251
8	1500	16.7	7.9	0.23	0.00555	0.00547
9A	1505	14.3	7.9	0.17	0.00349	0.00353
9B	1508	14.1	7.9	0.16	0.00311	0.00314
9C	1510	13.9	7.9	0.18	0.00355	0.00358
9D	1512	13.9	7.9	0.18	0.00355	0.00358
9E	1514	13.7	7.8	0.16	0.00241	0.00242
9F	1515	13.6	7.8	0.17	0.00264	0.00266
10A	1517	16.9	7.9	0.16	0.00403	0.00405
10B	1519	16.3	7.9	0.25	0.00597	0.00600
10C	1520	14.6	7.8	0.29	0.00475	0.00476
10D	1522	13.4	7.8	0.17	0.00260	0.00261
10E	1525	13.6	7.8	0.21	0.00314	0.00315

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #37

DATE: 5/21/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1050	14.5	7.2	0.17	0.00072	0.00082
1B	1055	13.9	7.4	0.21	0.00129	0.00146
1C	1100	13.8	7.3	0.21	0.00106	0.00120
1D	1105	13.3	7.4	0.19	0.00114	0.00128
1E	1110	12.9	7.4	0.24	0.00139	0.00156
1F	1115	12.8	7.4	0.20	0.00114	0.00128
2	1040	18.4	6.9	12.76	0.03570 STP	
3A	1130	13.5	7.4	0.21	0.00130	0.00145
3B	1132	13.5	7.4	0.20	0.00120	0.00134
3C	1135	13.5	7.4	0.21	0.00130	0.00145
4	1355	19.5	7.4	0.16	0.00157	0.00168
5A	1140	15.5	7.4	0.17	0.00122	0.00128
5B	1145	15.5	7.2	0.20	0.00089	0.00092
5C	1150	14.4	7.4	0.17	0.00113	0.00116
5D	1155	15.1	7.2	0.16	0.00068	0.00070
5E	1200	15.7	7.4	0.18	0.00130	0.00133
5F	1210	15.1	7.4	0.17	0.00119	0.00120
5G	1220	15.0	7.4	0.20	0.00135	0.00135
6	1255	N/A	N/A	N/A	INSUFFICIENT DATA	
7A	1258	14.0	7.5	0.15	0.00118	0.00124
7B	1300	14.0	7.4	0.16	0.00099	0.00104
7C	1302	14.3	7.4	0.13	0.00085	0.00090
7D	1305	14.7	7.5	0.17	0.00145	0.00152
8	1307	18.1	7.6	0.20	0.00268	0.00283
9A	1308	14.4	7.5	0.16	0.00135	0.00144
9B	1310	14.3	7.5	0.22	0.00181	0.00192
9C	1313	14.2	7.5	0.19	0.00153	0.00162
9D	1315	14.1	7.5	0.16	0.00125	0.00133
9E	1317	14.2	7.4	0.21	0.00138	0.00146
9F	1320	14.4	7.4	0.22	0.00145	0.00153
10A	1322	15.2	7.5	0.22	0.00194	0.00205
10B	1325	15.1	7.5	0.24	0.00206	0.00218
10C	1327	14.4	7.4	0.16	0.00102	0.00108
10D	1329	14.5	7.5	0.15	0.00122	0.00129
10E	1330	14.0	7.5	0.22	0.00177	0.00186

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #38

DATE: 6/ 1/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1320	12.4	7.2	0.19	0.00067	0.00070
1B	1330	11.9	7.1	0.16	0.00045	0.00047
1C	1340	13.1	7.1	0.18	0.00054	0.00056
1D	1345	13.0	7.1	0.12	0.00036	0.00038
1E	1350	13.2	7.1	0.12	0.00037	0.00038
1F	1400	13.3	7.1	0.15	0.00045	0.00046
2	1240	19.0	6.8	10.70	0.02486 STP	
3A	1415	12.5	7.1	0.15	0.00042	0.00043
3B	1417	12.3	7.2	0.14	0.00049	0.00050
3C	1419	12.4	7.1	0.13	0.00037	0.00038
4	1620	19.6	7.4	0.16	0.00158	0.00158
5A	1420	12.8	7.2	0.13	0.00048	0.00049
5B	1425	12.5	7.1	0.12	0.00033	0.00033
5C	1428	12.7	7.1	0.11	0.00031	0.00032
5D	1430	12.5	7.2	0.15	0.00053	0.00054
5E	1433	12.5	7.1	0.08	0.00023	0.00024
5F	1438	12.5	7.2	0.07	0.00026	0.00027
5G	1440	12.4	7.2	0.12	0.00044	0.00045
6	1525	23.0	7.8	4.64	0.14008 STP	
7A	1528	12.8	7.0	0.16	0.00038	0.00038
7B	1530	12.6	7.1	0.16	0.00045	0.00045
7C	1532	13.0	7.1	0.14	0.00041	0.00041
7D	1534	12.8	7.1	0.17	0.00050	0.00050
8	1535	18.3	7.2	0.19	0.00105	0.00105
9A	1537	13.0	7.1	0.19	0.00056	0.00056
9B	1539	13.0	7.1	0.18	0.00053	0.00053
9C	1540	13.0	7.1	0.18	0.00053	0.00053
9D	1542	12.8	7.1	0.12	0.00036	0.00036
9E	1543	12.7	7.1	0.16	0.00045	0.00045
9F	1544	13.2	7.1	0.16	0.00047	0.00047
10A	1545	14.6	7.1	0.16	0.00052	0.00052
10B	1546	13.0	7.1	0.23	0.00068	0.00068
10C	1547	12.9	7.1	0.16	0.00048	0.00048
10D	1549	12.8	7.0	0.12	0.00028	0.00028
10E	1550	12.6	7.1	0.10	0.00028	0.00028

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #39

DATE: 6/ 8/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1225	10.1	7.3	0.23	0.00086	0.00093
1B	1230	10.0	7.3	0.09	0.00034	0.00036
1C	1240	10.2	7.3	0.10	0.00037	0.00040
1D	1250	10.1	7.3	0.17	0.00064	0.00069
1E	1200	10.1	7.3	0.13	0.00049	0.00054
1F	1315	10.1	7.3	0.12	0.00046	0.00048
2	1215	16.7	6.8	8.05	0.01578 STP	
3A	1340	11.0	7.3	0.16	0.00063	0.00065
3B	1345	11.0	7.3	0.12	0.00046	0.00048
3C	1350	11.1	7.3	0.12	0.00046	0.00048
4	1620	13.4	7.4	0.16	0.00095	0.00095
5A	1355	11.0	7.3	0.16	0.00063	0.00064
5B	1400	11.0	7.3	0.10	0.00040	0.00040
5C	1405	10.9	7.3	0.11	0.00042	0.00043
5D	1410	10.8	7.3	0.14	0.00055	0.00056
5E	1412	10.8	7.3	0.12	0.00049	0.00050
5F	1415	10.8	7.2	0.12	0.00039	0.00039
5G	1420	11.0	7.3	0.14	0.00056	0.00057
6	1450	17.3	8.2	4.41	0.21622 STP	
7A	1452	11.1	7.3	0.11	0.00043	0.00043
7B	1455	11.3	7.3	0.12	0.00051	0.00051
7C	1500	11.3	7.3	0.09	0.00037	0.00037
7D	1503	11.4	7.3	0.12	0.00048	0.00047
8	1505	12.7	7.3	0.22	0.00101	0.00099
9A	1510	11.0	7.3	0.10	0.00040	0.00040
9B	1513	11.0	7.3	0.12	0.00049	0.00050
9C	1515	11.0	7.3	0.16	0.00066	0.00066
9D	1520	11.0	7.3	0.12	0.00049	0.00050
9E	1523	11.0	7.3	0.12	0.00046	0.00046
9F	1525	11.0	7.3	0.10	0.00040	0.00040
10A	1528	11.8	7.3	0.16	0.00067	0.00067
10B	1530	11.3	7.3	0.10	0.00040	0.00040
10C	1533	11.0	7.3	0.12	0.00049	0.00049
10D	1535	11.0	7.3	0.12	0.00049	0.00049
10E	1540	11.0	7.3	0.10	0.00040	0.00040

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #40

DATE: 6/13/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	930	14.4	7.3	0.32	0.00167	0.00197
1B	935	14.4	7.4	0.21	0.00140	0.00165
1C	940	14.5	7.3	0.18	0.00095	0.00111
1D	950	16.0	7.4	0.16	0.00121	0.00141
1E	1000	17.3	7.4	0.20	0.00160	0.00186
1F	1010	17.4	7.4	0.15	0.00121	0.00140
2	1020	20.8	6.9	11.74	0.03912 STP	
3A	1100	16.1	7.3	0.16	0.00092	0.00104
3B	1103	15.4	7.4	0.16	0.00110	0.00124
3C	1105	15.4	7.4	0.17	0.00122	0.00137
4	1255	19.6	7.3	0.21	0.00163	0.00186
5A	1107	15.5	7.3	0.18	0.00102	0.00110
5B	1109	15.3	7.4	0.13	0.00092	0.00099
5C	1110	15.5	7.4	0.15	0.00105	0.00113
5D	1112	15.5	7.4	0.12	0.00082	0.00088
5E	1113	15.5	7.4	0.12	0.00087	0.00094
5F	1114	15.4	7.4	0.09	0.00064	0.00068
5G	1115	15.5	7.4	0.13	0.00093	0.00100
6	1200	25.8	8.7	2.92	0.67674 STP	
7A	1202	16.0	7.3	0.10	0.00058	0.00062
7B	1204	16.1	7.4	0.10	0.00073	0.00079
7C	1206	16.0	7.4	0.10	0.00073	0.00078
7D	1208	15.9	7.4	0.16	0.00120	0.00129
8	1209	18.2	7.5	0.10	0.00107	0.00118
9A	1210	16.1	7.4	0.16	0.00116	0.00126
9B	1211	16.1	7.3	0.22	0.00131	0.00143
9C	1212	16.0	7.4	0.14	0.00103	0.00112
9D	1213	16.0	7.4	0.11	0.00079	0.00086
9E	1214	16.0	7.4	0.12	0.00085	0.00092
9F	1215	16.1	7.4	0.11	0.00079	0.00086
10A	1216	18.1	7.4	0.09	0.00078	0.00084
10B	1217	17.0	7.4	0.09	0.00072	0.00078
10C	1218	16.1	7.4	0.08	0.00061	0.00066
10D	1219	15.9	7.4	0.14	0.00102	0.00111
10E	1220	16.0	7.4	0.09	0.00067	0.00072

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #41

DATE: 6/20/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1355	12.0	7.4	0.12	0.00063	0.00064
1B	1400	12.8	7.3	0.14	0.00064	0.00066
1C	1410	12.2	7.3	0.15	0.00065	0.00066
1D	1420	13.0	7.3	0.16	0.00077	0.00078
1E	1430	13.0	7.4	0.15	0.00087	0.00088
1F	1435	12.8	7.3	0.25	0.00117	0.00118
2	1345	21.5	6.7	7.57	0.01676 STP	
3A	1520	12.8	7.4	0.18	0.00105	0.00105
3B	1522	12.6	7.3	0.12	0.00056	0.00056
3C	1524	12.6	7.3	0.19	0.00086	0.00086
4	1710	12.6	7.5	0.29	0.00206	0.00206
5A	1526	13.2	7.4	0.19	0.00113	0.00119
5B	1528	12.9	7.4	0.20	0.00115	0.00121
5C	1530	12.8	7.3	0.21	0.00095	0.00100
5D	1533	12.6	7.3	0.21	0.00097	0.00102
5E	1536	12.6	7.3	0.21	0.00093	0.00098
5F	1538	12.6	7.3	0.20	0.00089	0.00094
5G	1540	12.6	7.3	0.20	0.00089	0.00094
6	1620	23.2	7.9	3.17	0.12142 STP	
7A	1622	13.7	7.6	0.15	0.00145	0.00145
7B	1624	13.6	7.4	0.18	0.00111	0.00111
7C	1626	13.6	7.4	0.16	0.00101	0.00101
7D	1628	13.5	7.4	0.16	0.00095	0.00095
8	1630	18.2	7.6	0.37	0.00506	0.00506
9A	1632	14.2	7.5	0.19	0.00153	0.00153
9B	1634	13.8	7.4	0.20	0.00123	0.00123
9C	1636	13.5	7.4	0.20	0.00120	0.00120
9D	1638	13.5	7.4	0.21	0.00125	0.00125
9E	1640	13.5	7.4	0.21	0.00125	0.00125
9F	1642	13.6	7.4	0.19	0.00116	0.00116
10A	1644	14.1	7.6	0.09	0.00091	0.00091
10B	1646	13.7	7.4	0.25	0.00153	0.00153
10C	1648	13.5	7.4	0.15	0.00090	0.00090
10D	1650	13.5	7.4	0.07	0.00045	0.00045
10E	1655	13.5	7.4	0.25	0.00155	0.00155

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #42

DATE: 6/30/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1220	17.5	7.1	0.15	0.00061	0.00066
1B	1225	17.8	7.1	0.18	0.00077	0.00083
1C	1230	18.1	7.0	0.14	0.00048	0.00052
1D	1250	19.1	7.1	0.15	0.00069	0.00073
1E	1300	17.9	7.1	0.18	0.00077	0.00082
1F	1310	18.6	7.1	0.16	0.00070	0.00074
2	1215	14.0	6.9	3.95	0.00794 STP	
3A	930	16.7	7.1	0.21	0.00080	0.00095
3B	932	16.0	7.2	0.12	0.00054	0.00063
3C	935	16.2	7.2	0.18	0.00086	0.00101
4	1200	20.2	7.3	0.15	0.00118	0.00142
5A	938	16.5	7.4	0.21	0.00163	0.00193
5B	940	16.3	7.3	0.17	0.00103	0.00122
5C	942	16.1	7.3	0.12	0.00068	0.00080
5D	946	16.0	7.3	0.18	0.00106	0.00124
5E	949	16.0	7.3	0.12	0.00072	0.00084
5F	952	16.0	7.3	0.11	0.00063	0.00073
5G	955	16.1	7.2	0.14	0.00066	0.00076
6	1050	24.2	8.8	0.31	0.07916 STP	
7A	1053	17.4	7.2	0.12	0.00064	0.00071
7B	1055	16.8	7.2	0.15	0.00073	0.00081
7C	1100	16.8	7.1	0.21	0.00081	0.00089
7D	1102	16.8	7.1	0.17	0.00068	0.00075
8	1105	20.2	7.3	0.30	0.00243	0.00277
9A	1107	16.8	7.3	0.15	0.00092	0.00103
9B	1109	16.6	7.3	0.12	0.00071	0.00079
9C	1111	16.7	7.3	0.13	0.00081	0.00091
9D	1115	16.5	7.2	0.11	0.00052	0.00058
9E	1117	16.7	7.4	0.10	0.00077	0.00085
9F	1119	16.5	7.3	0.11	0.00065	0.00072
10A	1120	17.1	7.3	0.15	0.00094	0.00105
10B	1124	17.0	7.4	0.16	0.00130	0.00145
10C	1126	16.9	7.2	0.14	0.00070	0.00077
10D	1128	16.8	7.4	0.16	0.00122	0.00135
10E	1130	16.9	7.4	0.14	0.00110	0.00122

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #43

DATE: 7/ 5/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1310	15.3	7.0	0.15	0.00041	0.00044
1B	1315	17.3	7.0	0.14	0.00045	0.00048
1C	1320	15.5	7.0	N/A	INSUFFICIENT DATA	
1D	1330	17.1	7.0	0.19	0.00060	0.00063
1E	1340	18.5	7.0	0.21	0.00073	0.00076
1F	1350	18.8	7.0	0.22	0.00080	0.00083
2	1305	22.9	6.8	15.13	0.04664 STP	
3A	1130	16.6	7.1	0.12	0.00045	0.00049
3B	1133	16.4	7.1	0.15	0.00056	0.00063
3C	1135	16.1	7.2	0.07	0.00031	0.00034
4	1320	18.9	7.3	0.11	0.00078	0.00086
5A	1137	16.8	7.2	0.12	0.00061	0.00064
5B	1138	16.4	7.3	0.21	0.00124	0.00130
5C	1139	16.3	7.3	0.13	0.00079	0.00082
5D	1140	16.2	7.2	0.10	0.00047	0.00049
5E	1141	16.1	7.3	0.15	0.00087	0.00091
5F	1143	16.1	7.3	0.11	0.00063	0.00066
5G	1145	16.2	7.3	0.19	0.00112	0.00117
6	1225	21.1	8.6	0.39	0.05774 STP	
7A	1228	16.4	7.3	0.13	0.00079	0.00085
7B	1230	16.4	7.3	0.14	0.00084	0.00090
7C	1233	16.5	7.3	0.10	0.00060	0.00064
7D	1235	17.2	7.3	0.12	0.00079	0.00084
8	1237	18.4	7.2	0.19	0.00105	0.00113
9A	1238	16.7	7.2	0.08	0.00040	0.00043
9B	1240	16.8	7.1	0.07	0.00026	0.00028
9C	1242	16.6	7.2	0.09	0.00044	0.00047
9D	1244	16.6	7.2	0.06	0.00028	0.00030
9E	1246	16.6	7.1	0.07	0.00025	0.00027
9F	1248	17.3	7.1	0.08	0.00034	0.00036
10A	1250	16.6	7.2	0.13	0.00064	0.00069
10B	1252	16.5	7.2	0.16	0.00076	0.00081
10C	1255	16.5	7.3	0.13	0.00080	0.00086
10D	1258	16.5	7.3	0.12	0.00075	0.00080
10E	1300	16.5	7.1	0.26	0.00101	0.00108
1G	1345	17.8	7.3	0.16	0.00110	0.00114
2G	1348	17.4	7.4	0.17	0.00141	0.00141
1C	1355	15.7	7.1	0.12	0.00045	0.00046
2C	1357	15.5	7.3	0.11	0.00060	0.00060
3C	1400	15.3	7.3	0.04	0.00023	0.00023

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #44

DATE: 7/13/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1015	18.1	6.5	0.19	0.00021	0.00024
1B	1020	N/A	N/A	N/A	INSUFFICIENT DATA	
1C	1023	18.1	6.5	0.24	0.00026	0.00030
1D	1025	N/A	N/A	N/A	INSUFFICIENT DATA	
1E	1030	17.1	6.5	0.31	0.00032	0.00036
1F	1035	N/A	N/A	N/A	INSUFFICIENT DATA	
2	1010	22.6	6.5	10.95	0.01659 STP	
3A	1100	N/A	N/A	N/A	INSUFFICIENT DATA	
3B	1102	19.0	6.5	0.16	0.00018	0.00020
3C	1105	N/A	N/A	N/A	INSUFFICIENT DATA	
4	1320	19.9	6.7	0.25	0.00050	0.00056
5A	1107	18.7	6.9	0.15	0.00042	0.00046
5B	1109	N/A	N/A	N/A	INSUFFICIENT DATA	
5C	1110	18.8	6.6	0.11	0.00015	0.00017
5D	1112	N/A	N/A	N/A	INSUFFICIENT DATA	
5E	1115	18.5	6.5	0.18	0.00020	0.00022
5F	1120	N/A	N/A	N/A	INSUFFICIENT DATA	
5G	1125	N/A	N/A	N/A	INSUFFICIENT DATA	
6	1200	25.3	8.8	0.41	0.11033 STP	
7A	1203	19.1	6.5	0.16	0.00018	0.00020
7B	1205	N/A	N/A	N/A	INSUFFICIENT DATA	
7C	1207	19.1	6.6	0.21	0.00032	0.00034
7D	1209	N/A	N/A	N/A	INSUFFICIENT DATA	
8	1210	19.1	6.8	0.30	0.00071	0.00078
9A	1212	N/A	N/A	N/A	INSUFFICIENT DATA	
9B	1215	19.4	6.7	0.23	0.00044	0.00048
9C	1216	N/A	N/A	N/A	INSUFFICIENT DATA	
9D	1218	N/A	N/A	N/A	INSUFFICIENT DATA	
9E	1220	19.1	6.9	0.16	0.00046	0.00050
9F	1225	N/A	N/A	N/A	INSUFFICIENT DATA	
10A	1227	N/A	N/A	N/A	INSUFFICIENT DATA	
10B	1230	19.5	7.0	0.14	0.00053	0.00058
10C	1235	N/A	N/A	N/A	INSUFFICIENT DATA	
10D	1240	19.4	6.9	0.22	0.00067	0.00072
10E	1245	N/A	N/A	N/A	INSUFFICIENT DATA	

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #45

DATE: 7/21/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1535	22.5	7.4	0.34	0.00399	0.00399
1B	1540	21.7	7.4	0.15	0.00165	0.00165
1C	1550	21.0	7.4	0.09	0.00096	0.00096
1D	1600	21.2	7.4	0.08	0.00089	0.00089
1E	1630	21.2	7.4	0.10	0.00106	0.00106
1F	1700	21.4	7.4	0.12	0.00126	0.00126
2	1350	25.7	6.7	5.25	0.01567 STP	
3A	1400	N/A	N/A	N/A	INSUFFICIENT DATA	
3B	1405	N/A	N/A	N/A	INSUFFICIENT DATA	
3C	1410	N/A	N/A	N/A	INSUFFICIENT DATA	
4	1610	24.0	7.3	0.29	0.00301	0.00301
5A	1620	N/A	N/A	N/A	INSUFFICIENT DATA	
5B	1625	N/A	N/A	N/A	INSUFFICIENT DATA	
5C	1630	N/A	N/A	N/A	INSUFFICIENT DATA	
5D	1635	N/A	N/A	N/A	INSUFFICIENT DATA	
5E	1640	N/A	N/A	N/A	INSUFFICIENT DATA	
5F	1645	N/A	N/A	N/A	INSUFFICIENT DATA	
5G	1650	N/A	N/A	N/A	INSUFFICIENT DATA	
6	1440	24.0	8.0	0.16	0.00828 STP	
7A	1442	20.7	7.4	0.06	0.00060	0.00060
7B	1445	21.9	7.3	0.08	0.00074	0.00075
7C	1448	21.9	7.3	0.09	0.00082	0.00082
7D	1450	22.0	7.3	0.34	0.00306	0.00307
8	1455	22.8	7.5	0.31	0.00474	0.00468
9A	1500	21.0	7.4	0.12	0.00131	0.00133
9B	1505	20.9	7.4	0.15	0.00156	0.00158
9C	1510	20.8	7.4	0.05	0.00052	0.00052
9D	1515	20.7	7.3	0.08	0.00068	0.00068
9E	1520	20.8	7.3	0.01	0.00007	0.00007
9F	1525	21.0	7.3	0.17	0.00146	0.00146
10A	1530	21.3	7.2	0.54	0.00373	0.00373
10B	1535	21.1	7.3	0.34	0.00287	0.00286
10C	1540	20.8	7.3	0.08	0.00069	0.00069
10D	1545	20.7	7.3	0.33	0.00272	0.00272
10E	1555	20.7	7.3	0.32	0.00265	0.00265

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #46

DATE: 7/27/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1240	22.7	7.6	0.19	0.00357	0.00380
1B	1245	22.6	7.6	0.16	0.00308	0.00328
1C	1250	22.7	7.7	0.17	0.00408	0.00433
1D	1255	23.4	7.5	0.40	0.00637	0.00674
1E	1305	22.5	7.5	0.29	0.00427	0.00450
1F	1310	22.7	7.4	0.30	0.00355	0.00373
2	1220	27.1	6.9	0.39	0.00201 STP	
3A	1350	22.6	7.9	0.40	0.01479	0.01522
3B	1355	22.6	7.5	0.20	0.00295	0.00303
3C	1400	22.6	7.7	0.39	0.00907	0.00930
4	1403	24.3	7.3	0.31	0.00334	0.00355
5A	1405	26.1	7.6	0.58	0.01395	0.01419
5B	1408	25.7	7.8	0.11	0.00389	0.00396
5C	1410	24.4	7.8	0.18	0.00602	0.00613
5D	1412	24.4	7.7	0.11	0.00284	0.00290
5E	1414	24.6	7.8	0.21	0.00721	0.00735
5F	1417	24.4	7.8	0.20	0.00657	0.00669
5G	1420	24.2	7.9	0.23	0.00943	0.00962
6	1505	29.1	9.7	0.68	0.54024 STP	
7A	1508	24.3	7.3	0.30	0.00325	0.00324
7B	1510	24.3	7.3	0.21	0.00229	0.00227
7C	1518	24.3	7.1	0.27	0.00184	0.00182
7D	1520	24.3	7.2	0.06	0.00049	0.00049
8	1524	25.6	7.2	0.58	0.00537	0.00521
9A	1526	25.5	7.6	0.45	0.01037	0.01038
9B	1528	24.9	7.8	0.27	0.00934	0.00935
9C	1530	24.4	7.7	0.34	0.00897	0.00897
9D	1533	24.2	7.5	0.25	0.00426	0.00426
9E	1536	24.2	7.4	0.35	0.00460	0.00460
9F	1538	24.3	7.6	0.22	0.00469	0.00469
10A	1400	25.7	7.4	0.50	0.00742	0.00769
10B	1410	24.7	7.4	0.28	0.00386	0.00399
10C	1430	24.3	7.5	0.25	0.00429	0.00440
10D	1500	24.3	7.5	0.21	0.00360	0.00364
10E	1550	24.6	7.3	0.39	0.00422	0.00422

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #47

DATE: 8/ 4/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1605	17.4	7.2	0.30	0.00153	0.00153
1B	1108	17.6	7.1	0.35	0.00148	0.00165
1C	1110	N/A	7.2	0.21	INSUFFICIENT DATA	
1D	1115	N/A	7.2	0.56	INSUFFICIENT DATA	
1E	1120	N/A	7.3	0.32	INSUFFICIENT DATA	
1F	1130	N/A	7.1	0.16	INSUFFICIENT DATA	
2	1100	18.3	6.8	8.78	0.01938 STP	
3A	1030	N/A	N/A	N/A	INSUFFICIENT DATA	
3B	1035	N/A	N/A	N/A	INSUFFICIENT DATA	
3C	1040	N/A	N/A	N/A	INSUFFICIENT DATA	
4	1045	17.2	7.2	0.11	0.00054	0.00071
5A	1050	N/A	N/A	N/A	INSUFFICIENT DATA	
5B	1052	N/A	N/A	N/A	INSUFFICIENT DATA	
5C	1054	N/A	N/A	N/A	INSUFFICIENT DATA	
5D	1056	N/A	N/A	N/A	INSUFFICIENT DATA	
5E	1057	N/A	N/A	N/A	INSUFFICIENT DATA	
5F	1059	N/A	N/A	N/A	INSUFFICIENT DATA	
5G	1100	N/A	N/A	N/A	INSUFFICIENT DATA	
6	945	19.4	9.0	1.24	0.34203 STP	
7A	948	16.8	7.4	0.23	0.00180	0.00205
7B	950	16.8	7.4	0.31	0.00244	0.00278
7C	953	16.7	7.3	0.14	0.00086	0.00098
7D	955	16.8	7.4	0.07	0.00051	0.00058
8	1000	17.0	7.0	0.16	0.00052	0.00062
9A	1005	17.2	7.3	0.06	0.00037	0.00042
9B	1007	17.0	7.3	0.30	0.00187	0.00215
9C	1010	16.8	7.4	0.24	0.00186	0.00214
9D	1015	16.8	7.4	0.25	0.00193	0.00221
9E	1017	16.9	7.4	0.26	0.00206	0.00235
9F	1020	16.7	7.4	0.10	0.00077	0.00087
10A	1022	17.4	7.1	0.22	0.00091	0.00104
10B	1024	17.2	7.1	0.36	0.00147	0.00167
10C	1026	16.9	7.4	0.21	0.00162	0.00184
10D	1028	16.8	7.3	0.11	0.00066	0.00076
10E	1030	16.8	7.4	0.13	0.00103	0.00117

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #48A

DATE: 8/ 7/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1310	24.5	7.7	0.18	0.00485	0.00509
1B	1315	24.5	7.7	0.16	0.00419	0.00438
1C	1320	24.5	7.6	0.14	0.00299	0.00312
1D	1325	24.5	7.6	0.23	0.00493	0.00513
1E	1330	24.5	7.6	0.16	0.00352	0.00366
1F	1340	25.0	7.6	0.10	0.00219	0.00226
2	1300	24.5	6.9	13.82	0.06005 STP	
3A	1400	24.0	7.6	0.14	0.00289	0.00296
3B	1405	24.5	7.7	0.23	0.00617	0.00630
3C	1410	25.0	7.7	0.34	0.00935	0.00953
4	1620	27.0	7.7	0.21	0.00653	0.00653
5A	1415	24.5	7.6	0.14	0.00299	0.00305
5B	1420	24.5	7.7	0.08	0.00220	0.00225
5C	1425	24.5	7.7	0.07	0.00176	0.00180
5D	1430	25.0	7.7	0.18	0.00502	0.00513
5E	1433	24.5	7.7	0.35	0.00925	0.00946
5F	1435	24.5	7.7	0.13	0.00353	0.00361
5G	1440	24.5	7.7	0.16	0.00441	0.00451
6	1500	27.0	8.4	0.26	0.03717 STP	
7A	1505	24.5	7.7	0.20	0.00529	0.00527
7B	1508	24.5	7.7	0.15	0.00397	0.00395
7C	1510	24.5	7.8	0.09	0.00303	0.00302
7D	1517	24.5	7.7	0.12	0.00330	0.00328
8	1520	26.0	7.7	0.14	0.00415	0.00404
9A	1522	25.5	7.7	0.14	0.00401	0.00402
9B	1525	25.0	7.7	0.08	0.00228	0.00228
9C	1528	25.0	7.8	0.01	0.00029	0.00029
9D	1530	25.0	7.7	0.11	0.00296	0.00296
9E	1534	25.0	7.8	0.28	0.00969	0.00967
9F	1537	25.0	7.7	0.01	0.00023	0.00023
10A	1540	25.0	7.7	N/A	INSUFFICIENT DATA	
10B	1545	25.0	7.7	0.07	0.00205	0.00205
10C	1550	25.0	7.7	0.16	0.00456	0.00456
10D	1553	24.5	7.7	0.21	0.00573	0.00573
10E	1555	24.5	7.5	0.27	0.00463	0.00463

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #48B

DATE: 8/11/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1400	24.1	7.3	0.21	0.00225	0.00231
1B	1405	24.6	7.4	0.23	0.00316	0.00323
1C	1410	25.3	7.4	0.34	0.00485	0.00495
1D	1420	24.3	7.5	0.21	0.00360	0.00365
1E	1430	24.4	7.5	0.30	0.00502	0.00507
1F	1440	24.5	7.5	0.22	0.00379	0.00381
2	1550	24.6	8.5	7.02	1.04562 STP	
3A	1500	24.4	7.4	0.21	0.00278	0.00276
3B	1505	24.1	7.4	0.30	0.00392	0.00389
3C	1510	24.4	7.6	0.21	0.00454	0.00454
4	1512	25.8	7.4	0.25	0.00380	0.00380
5A	1515	24.9	7.4	0.33	0.00460	0.00474
5B	1520	24.6	7.6	0.35	0.00762	0.00798
5C	1525	24.7	7.7	0.37	0.01005	0.01053
5D	1530	24.7	7.4	0.28	0.00386	0.00404
5E	1534	24.8	7.3	N/A	INSUFFICIENT DATA	
5F	1538	24.5	7.5	0.09	0.00154	0.00162
5G	1545	24.6	7.5	0.16	0.00283	0.00296
6	1620	26.4	6.9	0.77	0.00384 STP	
7A	1625	24.8	7.5	0.34	0.00588	0.00588
7B	1627	24.7	7.5	0.21	0.00370	0.00370
7C	1630	24.7	7.4	0.36	0.00499	0.00499
7D	1635	25.0	7.1	0.37	0.00263	0.00263
8	1637	26.2	7.5	0.22	0.00426	0.00426
9A	1640	25.3	7.5	0.11	0.00193	0.00193
9B	1645	25.0	7.4	0.16	0.00220	0.00220
9C	1647	25.0	7.5	0.24	0.00422	0.00422
9D	1650	24.8	7.5	0.27	0.00473	0.00473
9E	1653	25.0	7.5	0.12	0.00218	0.00218
9F	1655	25.1	7.5	0.38	0.00673	0.00673
10A	1658	25.0	7.3	0.37	0.00415	0.00415
10B	1660	25.0	7.2	0.23	0.00206	0.00206
10C	1665	25.0	7.4	0.21	0.00290	0.00290
10D	1667	25.1	7.5	0.21	0.00381	0.00381
10E	1700	25.0	7.5	N/A	INSUFFICIENT DATA	

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #49A

DATE: 8/14/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1320	19.7	7.3	0.12	0.00095	0.00099
1B	1330	19.9	7.4	0.06	0.00056	0.00059
1C	1340	19.6	7.4	0.08	0.00079	0.00082
1D	1350	19.5	7.6	0.14	0.00210	0.00216
1E	1355	19.5	7.4	0.12	0.00118	0.00121
1F	1400	19.5	7.4	0.15	0.00141	0.00145
2	1310	23.3	7.2	0.19	0.00150 STP	
3A	1420	19.8	7.4	N/A	INSUFFICIENT DATA	
3B	1422	19.8	7.6	0.04	0.00063	0.00064
3C	1425	19.7	7.5	0.12	0.00140	0.00142
4	1620	19.7	7.6	0.43	0.00651	0.00651
5A	1428	19.2	7.6	0.12	0.00181	0.00185
5B	1430	19.1	7.6	0.10	0.00144	0.00147
5C	1433	19.2	7.6	0.10	0.00145	0.00148
5D	1436	19.2	7.6	0.11	0.00157	0.00161
5E	1438	19.2	7.6	0.10	0.00145	0.00149
5F	1440	19.4	7.5	N/A	INSUFFICIENT DATA	
5G	1445	19.5	7.5	0.13	0.00157	0.00162
6	1510	20.2	7.9	1.86	0.05766 STP	
7A	1512	19.0	7.6	0.10	0.00143	0.00142
7B	1515	18.9	7.5	0.05	0.00057	0.00056
7C	1518	18.9	7.6	0.07	0.00106	0.00106
7D	1520	19.0	7.6	0.08	0.00119	0.00119
8	1523	18.7	7.6	0.10	0.00140	0.00136
9A	1525	19.1	7.6	0.11	0.00156	0.00156
9B	1530	19.0	7.4	N/A	INSUFFICIENT DATA	
9C	1533	19.0	7.5	0.11	0.00123	0.00123
9D	1536	18.8	7.5	0.12	0.00140	0.00140
9E	1538	19.0	7.5	0.10	0.00114	0.00114
9F	1540	19.4	7.6	0.15	0.00221	0.00221
10A	1542	18.5	7.3	0.05	0.00035	0.00035
10B	1544	18.2	7.6	0.07	0.00101	0.00101
10C	1545	19.2	7.6	0.07	0.00097	0.00097
10D	1548	19.2	7.6	N/A	INSUFFICIENT DATA	
10E	1550	19.2	7.6	N/A	INSUFFICIENT DATA	

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #49B

DATE: 8/18/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	920	16.6	8.1	0.12	0.00431	0.00508
1B	925	16.4	7.9	0.16	0.00388	0.00458
1C	930	16.3	8.1	0.12	0.00452	0.00530
1D	935	16.1	8.0	0.19	0.00546	0.00641
1E	940	16.1	8.0	0.19	0.00546	0.00639
1F	950	16.4	7.9	0.07	0.00155	0.00181
2	1005	22.0	7.0	12.81	0.05858 STP	
3A	820	16.5	7.7	0.16	0.00236	0.00289
3B	822	16.8	7.6	0.14	0.00172	0.00210
3C	825	16.6	7.6	0.25	0.00310	0.00377
4	827	16.5	7.9	0.10	0.00235	0.00349
5A	830	15.8	7.8	0.09	0.00163	0.00206
5B	833	15.8	7.8	0.14	0.00252	0.00317
5C	835	15.9	7.7	0.20	0.00286	0.00359
5D	837	15.8	7.5	0.13	0.00120	0.00151
5E	840	15.8	7.7	0.08	0.00118	0.00148
5F	845	16.0	7.8	0.13	0.00241	0.00299
5G	850	16.0	7.8	0.19	0.00346	0.00428
6	725	17.3	7.3	3.96	0.02557 STP	
7A	727	16.3	7.8	0.19	0.00354	0.00426
7B	730	16.3	8.0	0.45	0.01326	0.01592
7C	732	16.9	7.9	0.15	0.00362	0.00435
7D	735	16.5	7.8	0.12	0.00218	0.00262
8	737	16.2	7.9	0.10	0.00230	0.00298
9A	740	16.3	7.9	0.07	0.00173	0.00211
9B	742	16.5	7.9	0.17	0.00411	0.00500
9C	744	16.5	7.9	0.16	0.00391	0.00476
9D	746	16.4	8.0	0.21	0.00607	0.00737
9E	748	16.4	7.9	0.29	0.00679	0.00825
9F	750	16.1	7.8	0.12	0.00212	0.00258
10A	752	15.3	7.6	0.18	0.00200	0.00243
10B	754	15.4	7.5	0.20	0.00175	0.00213
10C	756	15.8	7.9	0.08	0.00186	0.00225
10D	758	16.0	7.8	0.16	0.00301	0.00365
10E	800	16.1	7.8	N/A	INSUFFICIENT DATA	

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #50A

DATE: 8/21/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	950	17.0	8.1	0.08	0.00317	0.00368
1B	955	17.0	8.1	0.12	0.00475	0.00550
1C	1000	16.9	7.8	0.15	0.00289	0.00335
1D	1005	16.9	7.8	0.19	0.00370	0.00427
1E	1010	17.0	7.8	0.16	0.00308	0.00355
1F	1015	17.0	7.7	0.15	0.00232	0.00267
2	1020	21.8	6.9	10.09	0.03616 STP	
3A	930	17.0	7.6	N/A	INSUFFICIENT DATA	
3B	932	17.0	8.0	0.08	0.00254	0.00297
3C	935	17.2	8.0	0.16	0.00489	0.00572
4	840	15.7	7.9	0.12	0.00277	0.00407
5A	937	16.2	7.9	0.12	0.00287	0.00338
5B	940	15.9	7.8	0.16	0.00284	0.00334
5C	942	15.8	7.7	0.15	0.00213	0.00250
5D	944	15.8	7.8	0.11	0.00193	0.00226
5E	945	15.9	7.8	0.22	0.00403	0.00472
5F	950	16.0	7.8	N/A	INSUFFICIENT DATA	
5G	955	16.1	8.0	0.16	0.00451	0.00522
6	705	17.0	7.0	4.53	0.01438 STP	
7A	707	15.9	8.1	0.12	0.00410	0.00496
7B	710	16.2	8.0	0.12	0.00359	0.00435
7C	712	16.1	8.0	0.11	0.00309	0.00374
7D	715	15.9	8.0	0.05	0.00140	0.00170
8	717	15.5	7.9	0.10	0.00218	0.00287
9A	720	16.1	8.0	0.16	0.00475	0.00584
9B	723	16.1	8.0	0.13	0.00380	0.00466
9C	726	16.2	7.9	0.16	0.00363	0.00446
9D	730	15.9	8.1	0.11	0.00380	0.00465
9E	733	16.6	8.0	0.08	0.00246	0.00301
9F	735	17.2	8.0	0.12	0.00386	0.00470
10A	737	14.3	7.8	0.12	0.00186	0.00228
10B	740	14.9	7.8	0.12	0.00208	0.00254
10C	745	16.4	7.8	0.17	0.00325	0.00396
10D	750	16.4	8.1	0.14	0.00516	0.00624
10E	755	17.2	8.1	0.17	0.00675	0.00814

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #50B

DATE: 8/25/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1030	17.8	8.1	0.04	0.00168	0.00191
1B	1035	17.9	8.0	0.14	0.00460	0.00522
1C	1037	18.2	8.0	0.04	0.00138	0.00157
1D	1040	17.6	8.0	0.07	0.00212	0.00240
1E	1045	18.3	8.0	0.13	0.00446	0.00503
1F	1050	17.9	8.0	0.07	0.00217	0.00244
2	1100	21.8	6.8	10.89	0.03101 STP	
3A	1000	18.6	8.1	0.12	0.00497	0.00573
3B	955	17.8	8.1	0.08	0.00335	0.00388
3C	952	17.1	8.1	0.10	0.00383	0.00444
4	1010	16.7	7.9	0.06	0.00139	0.00187
5A	950	16.5	7.9	0.06	0.00137	0.00159
5B	945	16.3	8.0	0.08	0.00241	0.00282
5C	940	16.2	7.8	0.12	0.00214	0.00251
5D	935	16.8	8.1	0.12	0.00437	0.00515
5E	930	17.0	8.0	0.07	0.00228	0.00270
5F	927	16.9	7.9	0.07	0.00161	0.00192
5G	925	17.3	8.0	0.14	0.00441	0.00524
6	745	17.8	7.0	3.99	0.01343 STP	
7A	747	17.1	8.1	0.13	0.00511	0.00607
7B	750	17.0	8.0	0.14	0.00431	0.00513
7C	755	17.0	8.0	0.21	0.00660	0.00783
7D	757	17.2	8.1	0.17	0.00675	0.00799
8	800	16.0	7.9	0.07	0.00170	0.00217
9A	803	16.6	7.9	0.13	0.00315	0.00380
9B	805	16.9	7.8	0.06	0.00112	0.00136
9C	808	17.0	7.9	0.07	0.00162	0.00195
9D	810	17.4	7.9	0.08	0.00209	0.00251
9E	815	17.7	7.9	0.11	0.00277	0.00332
9F	820	17.7	8.0	0.07	0.00213	0.00255
10A	825	15.1	7.6	0.05	0.00054	0.00064
10B	830	15.0	7.7	0.06	0.00078	0.00093
10C	835	17.0	7.9	0.07	0.00182	0.00217
10D	837	17.4	8.0	0.15	0.00470	0.00558
10E	840	17.0	7.9	0.07	0.00162	0.00193

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #51A

DATE: 8/28/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1110	21.6	8.1	0.10	0.00525	0.00583
1B	1115	21.4	8.2	0.32	0.02090 **	0.02312 **
1C	1120	19.2	8.0	0.23	0.00831	0.00922
1D	1130	19.2	7.9	0.19	0.00547	0.00604
1E	1140	19.2	8.0	0.17	0.00624	0.00685
1F	1145	19.4	8.4	0.12	0.01075	0.01172
2	1105	23.0	7.0	11.00	0.05400 STP	
3A	1325	22.3	8.1	0.25	0.01376	0.01433
3B	1330	21.3	8.2	0.21	0.01331	0.01382
3C	1335	21.7	8.1	0.22	0.01189	0.01233
4	1440	21.8	8.0	0.28	0.01211	0.01240
5A	1340	20.5	8.1	N/A	INSUFFICIENT DATA	
5B	1345	20.5	8.1	0.27	0.01338	0.01357
5D	1350	21.2	8.1	0.19	0.00979	0.00993
5E	1355	20.6	8.1	0.20	0.00980	0.00996
5F	1400	21.2	8.1	0.17	0.00894	0.00909
5G	1415	21.2	8.3	0.25	0.02030 **	0.02067 **
6	1215	23.4	7.3	7.00	0.07021 STP	
7A	1217	23.0	8.1	0.13	0.00770	0.00818
7B	1220	22.3	8.0	0.16	0.00737	0.00784
7C	1222	23.5	8.2	0.16	0.01233	0.01307
7D	1224	23.5	8.1	0.19	0.01144	0.01213
8	1225	23.2	8.0	0.21	0.00980	0.01058
9A	1227	22.3	8.1	0.23	0.01285	0.01380
9B	1230	22.3	8.1	0.19	0.01055	0.01133
9C	1232	22.3	8.1	0.20	0.01101	0.01181
9D	1235	23.2	8.1	0.18	0.01073	0.01148
9E	1237	22.8	8.0	0.26	0.01221	0.01307
9F	1240	23.5	8.1	0.16	0.00995	0.01063
10A	1243	22.2	8.0	0.22	0.00989	0.01056
10B	1246	22.0	8.0	0.18	0.00795	0.00848
10C	1248	22.7	8.0	0.17	0.00796	0.00848
10D	1250	21.9	8.1	0.16	0.00893	0.00951
10E	1255	22.0	8.1	0.19	0.01034	0.01099

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #51B

DATE: 9/ 2/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1050	18.7	8.1	0.21	0.00930	0.01046
1B	1055	18.5	8.2	0.15	0.00790	0.00886
1C	1100	18.5	8.2	0.19	0.01010	0.01129
1D	1105	18.2	8.1	0.17	0.00725	0.00810
1E	1110	18.1	8.2	0.23	0.01195	0.01330
1F	1115	18.3	8.1	0.19	0.00799	0.00889
2	1045	21.7	6.8	11.32	0.03202 STP	
3A	945	19.1	8.1	0.21	0.00919	0.01067
3B	947	17.2	8.0	0.24	0.00746	0.00869
3C	950	17.5	8.0	0.19	0.00605	0.00703
4	1050	16.1	7.9	0.19	0.00437	0.00565
5A	955	16.4	7.9	0.21	0.00485	0.00562
5B	1000	16.4	7.9	0.17	0.00408	0.00470
5C	1005	16.4	8.0	0.17	0.00510	0.00584
5D	1010	16.5	7.9	0.16	0.00371	0.00424
5E	1015	16.7	8.0	0.23	0.00695	0.00788
5F	1020	17.1	8.1	0.16	0.00606	0.00683
5G	1025	17.0	7.6	0.18	0.00226	0.00255
6	745	16.7	7.2	6.42	0.03152 STP	
7A	747	16.2	7.9	0.14	0.00325	0.00388
7B	750	16.2	8.0	0.21	0.00598	0.00713
7C	752	16.6	8.0	0.19	0.00567	0.00674
7D	755	16.3	8.0	0.17	0.00506	0.00602
8	800	15.6	6.6	N/A	INSUFFICIENT DATA	
9A	805	16.1	7.9	0.17	0.00399	0.00481
9B	810	16.6	7.9	0.23	0.00551	0.00664
9C	815	16.4	8.0	N/A	INSUFFICIENT DATA	
9D	820	16.7	8.0	0.19	0.00571	0.00683
9E	825	16.4	7.9	0.15	0.00349	0.00418
9F	830	16.3	7.9	0.26	0.00617	0.00736
10A	840	15.3	7.7	0.19	0.00262	0.00312
10B	845	15.4	8.1	0.11	0.00367	0.00435
10C	850	15.4	7.7	0.17	0.00241	0.00286
10D	855	16.8	8.0	0.16	0.00500	0.00590
10E	900	16.5	8.0	0.21	0.00612	0.00720

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #52A

DATE: 9/ 5/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)		TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1030	18.0	7.9	0.12	0.00327		0.00373
1B	1035	17.3	8.0	0.01	0.00026		0.00029
1C	1037	16.8	8.1	0.22	0.00843		0.00957
1D	1040	16.9	8.1	0.20	0.00755		0.00855
1E	1045	16.6	8.2	0.21	0.00960		0.01083
1F	1050	16.6	8.2	0.18	0.00844		0.00951
2	1100	21.6	6.9	9.29	0.03282	STP	
3A	900	18.3	7.9	0.16	0.00423		0.00504
3B	905	16.8	7.9	0.17	0.00420		0.00500
3C	910	16.8	8.1	0.17	0.00656		0.00777
4	1015	15.3	7.8	0.18	0.00314		0.00422
5A	915	15.4	8.0	0.09	0.00248		0.00299
5B	920	15.4	7.9	0.12	0.00252		0.00303
5C	930	15.5	8.0	0.19	0.00523		0.00621
5D	940	15.3	7.9	0.20	0.00430		0.00506
5E	950	15.8	8.0	0.13	0.00372		0.00433
5F	1000	16.0	8.1	0.18	0.00648		0.00746
5G	1005	16.3	8.1	0.16	0.00572		0.00655
6	720	15.5	8.3	5.60	0.30072	STP	
7A	725	15.6	8.0	0.10	0.00275		0.00331
7B	730	15.8	8.1	0.12	0.00436		0.00523
7C	735	15.7	8.0	0.12	0.00346		0.00415
7D	740	15.8	7.9	0.16	0.00353		0.00423
8	745	14.5	7.9	0.16	0.00321		0.00416
9A	750	15.1	7.9	0.16	0.00353		0.00429
9B	755	15.6	8.0	0.19	0.00527		0.00638
9C	800	15.8	8.1	0.16	0.00552		0.00666
9D	805	15.8	8.0	0.12	0.00325		0.00392
9E	807	15.8	8.0	0.16	0.00465		0.00560
9F	810	15.9	7.9	0.12	0.00281		0.00338
10A	815	14.8	7.8	0.12	0.00206		0.00249
10B	820	15.3	7.8	0.16	0.00271		0.00326
10C	823	15.8	7.8	0.15	0.00267		0.00320
10D	825	16.3	8.0	0.17	0.00506		0.00605
10E	830	15.7	8.0	0.11	0.00300		0.00358

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #52B

DATE: 9/ 8/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1340	22.8	8.1	0.21	0.01187	0.01226
1B	1345	22.5	8.2	0.12	0.00808	0.00833
1C	1350	21.5	7.6	0.24	0.00413	0.00426
1D	1355	20.9	8.0	0.21	0.00837	0.00859
1E	1400	20.9	8.3	0.21	0.01604	0.01642
1F	1415	20.6	7.9	0.17	0.00551	0.00561
2	1330	23.0	6.9	11.52	0.04499 STP	
3A	1600	21.8	8.4	0.12	0.01176	0.01176
3C	1605	21.4	8.3	N/A	INSUFFICIENT DATA	
4	1715	22.1	8.1	0.16	0.00860	0.00860
5A	1610	21.3	8.2	0.08	0.00532	0.00557
5B	1615	21.9	8.2	0.14	0.00942	0.00986
5C	1620	21.5	8.4	0.18	0.01812	0.01893
5D	1625	21.5	8.3	0.12	0.01002	0.01048
5E	1630	21.9	8.2	0.28	0.01885	0.01972
5F	1640	21.6	8.4	0.20	0.01989	0.02078 **
5G	1655	21.5	8.2	0.14	0.00917	0.00960
6	1435	22.2	7.2	7.75	0.05679 STP	
7A	1437	20.4	8.4	0.14	0.01302	0.01313
7B	1440	20.4	8.4	0.16	0.01456	0.01466
7C	1442	20.6	8.2	0.24	0.01472	0.01481
7D	1445	20.5	8.4	0.20	0.01851	0.01860
8	1450	21.8	8.0	0.16	0.00677	0.00671
9A	1455	20.9	8.4	0.14	0.01346	0.01364
9B	1500	20.8	8.3	0.14	0.01084	0.01096
9C	1505	20.7	8.3	0.24	0.01836	0.01854
9D	1510	20.5	8.2	0.14	0.00857	0.00863
9E	1514	20.8	8.2	0.17	0.01080	0.01087
9F	1517	20.7	8.4	0.16	0.01485	0.01492
10A	1520	21.4	8.0	0.14	0.00589	0.00591
10B	1522	21.4	8.0	0.07	0.00312	0.00313
10C	1525	21.2	8.1	0.16	0.00851	0.00853
10D	1527	21.1	8.4	0.13	0.01284	0.01285
10E	1530	20.9	8.4	0.14	0.01346	0.01346

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #53A

DATE: 9/11/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1040	17.4	7.9	0.10	0.00251	0.00284
1B	1045	17.4	7.7	0.06	0.00093	0.00105
1C	1050	17.3	7.9	0.02	0.00062	0.00070
1D	1100	17.3	7.7	0.07	0.00119	0.00134
1E	1110	17.2	8.0	0.05	0.00154	0.00172
1F	1120	17.2	7.9	0.09	0.00226	0.00252
2	1125	22.0	7.1	7.71	0.04430 STP	
3A	930	N/A	N/A	N/A	INSUFFICIENT DATA	
3B	935	16.5	7.9	0.07	0.00176	0.00206
3C	940	16.9	8.0	0.04	0.00126	0.00147
4	1025	16.3	7.8	0.03	0.00062	0.00082
5A	945	16.4	7.9	0.06	0.00136	0.00159
5B	947	16.6	7.8	0.05	0.00094	0.00110
5C	950	16.4	7.9	0.05	0.00116	0.00135
5D	955	16.4	8.0	0.07	0.00194	0.00225
5E	1000	16.7	7.9	0.01	0.00020	0.00023
5F	1005	17.0	7.8	0.04	0.00081	0.00093
5G	1010	16.6	7.9	0.04	0.00098	0.00112
6	750	17.7	8.6	3.24	0.38157 STP	
7A	752	16.4	8.0	0.01	0.00024	0.00029
7B	755	16.8	8.0	0.08	0.00250	0.00297
7C	800	16.4	8.1	0.02	0.00061	0.00072
7D	805	16.8	8.0	0.04	0.00125	0.00148
8	810	15.9	7.9	0.05	0.00112	0.00143
9A	815	16.8	8.1	0.01	0.00031	0.00037
9B	820	16.0	8.1	0.05	0.00177	0.00212
9C	825	16.9	8.0	0.02	0.00050	0.00060
9D	830	17.0	8.1	0.04	0.00158	0.00188
9E	835	16.8	8.0	0.02	0.00075	0.00089
9F	837	16.8	8.1	0.02	0.00094	0.00111
10A	840	14.5	7.7	0.02	0.00032	0.00038
10B	845	15.2	7.8	0.02	0.00028	0.00034
10C	850	15.0	7.8	0.01	0.00014	0.00017
10D	855	17.2	8.1	0.05	0.00193	0.00227
10E	900	16.8	8.0	0.05	0.00150	0.00177

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #53B

DATE: 9/15/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1350	17.3	8.3	0.02	0.00150	0.00155
1B	1355	16.8	8.3	0.01	0.00048	0.00050
1C	1400	16.0	8.3	0.12	0.00641	0.00657
1D	1410	15.6	8.3	0.16	0.00889	0.00907
1E	1415	15.6	8.2	0.06	0.00250	0.00255
1F	1420	15.8	8.2	0.03	0.00145	0.00147
2	1340	21.8	7.0	5.81	0.02620 STP	
3A	1625	19.5	8.3	0.05	0.00350	0.00350
3B	1627	18.1	8.2	0.06	0.00299	0.00299
3C	1630	18.2	8.2	0.08	0.00430	0.00430
4	1635	19.3	8.2	0.03	0.00186	0.00186
5A	1640	18.4	8.4	0.06	0.00469	0.00491
5B	1642	18.0	8.2	0.08	0.00424	0.00444
5C	1645	17.6	8.2	N/A	INSUFFICIENT DATA	
5D	1650	18.4	8.4	0.06	0.00469	0.00491
5E	1655	18.1	8.2	0.12	0.00640	0.00671
5F	1700	17.8	8.4	0.05	0.00386	0.00404
5G	1705	17.9	8.4	0.10	0.00777	0.00814
6	1450	19.8	8.0	3.18	0.11989 STP	
7A	1452	17.9	8.3	0.01	0.00052	0.00052
7B	1455	18.0	8.3	0.01	0.00053	0.00053
7C	1500	18.1	8.4	0.03	0.00263	0.00262
7D	1505	18.4	8.3	0.05	0.00325	0.00324
8	1507	18.5	8.2	0.03	0.00176	0.00172
9A	1510	17.8	8.2	0.07	0.00334	0.00337
9B	1512	17.5	8.3	0.06	0.00356	0.00358
9C	1515	17.5	8.4	0.05	0.00378	0.00380
9D	1520	17.2	8.3	0.03	0.00199	0.00200
9E	1525	17.3	8.3	0.03	0.00201	0.00201
9F	1530	17.5	8.3	0.22	0.01373	0.01373
10A	1532	18.6	7.9	0.07	0.00182	0.00182
10B	1535	18.3	7.8	0.08	0.00178	0.00178
10C	1540	18.3	7.7	0.01	0.00014	0.00014
10D	1542	17.6	8.3	0.03	0.00205	0.00205
10E	1545	17.4	8.3	0.07	0.00404	0.00404

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #54A

DATE: 9/18/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1325	18.2	7.9	0.08	0.00221	0.00231
1B	1330	18.1	8.1	0.18	0.00754	0.00784
1C	1340	17.8	8.2	0.26	0.01337	0.01384
1D	1350	17.5	8.2	0.13	0.00655	0.00674
1E	1400	17.6	8.0	0.26	0.00848	0.00869
1F	1405	18.1	7.7	0.55	0.00938	0.00959
2	1315	22.0	7.0	10.69	0.04888 STP	
3A	1545	20.1	8.3	0.18	0.01338	0.01338
3B	1550	18.7	8.3	0.11	0.00718	0.00718
3C	1555	18.7	8.3	0.07	0.00442	0.00442
4	1700	20.1	8.2	0.12	0.00736	0.00736
5A	1600	18.9	8.0	0.21	0.00756	0.00793
5B	1610	18.9	8.2	0.18	0.00993	0.01041
5C	1615	18.7	8.2	0.16	0.00846	0.00886
5D	1620	19.0	8.3	0.13	0.00903	0.00945
5E	1625	19.0	8.1	0.14	0.00621	0.00651
5F	1630	18.9	8.2	0.14	0.00767	0.00804
5G	1640	18.7	8.3	0.25	0.01713	0.01794
6	1435	19.0	9.0	2.59	0.69841 STP	
7A	1437	18.5	8.3	0.13	0.00872	0.00879
7B	1440	18.7	8.2	0.14	0.00757	0.00762
7C	1442	18.6	8.3	0.13	0.00878	0.00884
7D	1445	18.6	8.3	0.13	0.00878	0.00883
8	1450	18.7	8.1	0.17	0.00751	0.00744
9A	1435	18.7	8.3	0.10	0.00663	0.00678
9B	1455	18.4	8.3	0.09	0.00595	0.00604
9C	1500	18.8	8.2	0.11	0.00583	0.00590
9D	1502	18.7	8.4	0.13	0.01094	0.01106
9E	1505	18.5	8.2	0.13	0.00702	0.00709
9F	1508	18.8	8.2	0.14	0.00762	0.00769
10A	1510	19.4	7.7	0.23	0.00431	0.00434
10B	1513	19.0	7.8	0.13	0.00299	0.00302
10C	1515	19.0	7.8	0.18	0.00412	0.00414
10D	1518	18.3	8.2	0.08	0.00433	0.00435
10E	1520	18.1	8.4	0.19	0.01510	0.01515

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5

** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5

IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #54B

DATE: 9/22/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1325	18.3	7.6	0.10	0.00136	0.00142
1B	1340	N/A	N/A	N/A	INSUFFICIENT DATA	
1C	1345	17.7	7.8	0.06	0.00119	0.00123
1D	1350	17.7	7.8	0.06	0.00119	0.00123
1E	1400	18.1	7.7	0.10	0.00168	0.00172
1F	1405	18.1	7.8	0.12	0.00263	0.00269
2	1305	22.3	6.8	9.85	0.02909 STP	
3A	1550	20.7	8.1	0.12	0.00576	0.00576
3B	1555	18.9	8.0	0.15	0.00523	0.00523
3C	1600	19.0	8.1	0.07	0.00292	0.00292
4	1710	20.3	8.0	0.11	0.00417	0.00417
5A	1605	18.9	8.0	0.03	0.00116	0.00122
5B	1610	18.9	8.0	0.03	0.00116	0.00122
5C	1615	19.0	8.0	0.09	0.00322	0.00338
5D	1620	19.0	8.0	0.04	0.00146	0.00154
5E	1625	19.0	8.1	0.07	0.00292	0.00306
5F	1630	18.6	8.0	0.07	0.00256	0.00269
5G	1640	19.0	8.0	0.07	0.00234	0.00246
6	1445	18.7	7.8	0.37	0.00824 STP	
7A	1450	18.4	7.7	0.05	0.00086	0.00086
7B	1452	18.5	7.8	0.07	0.00144	0.00145
7C	1455	18.1	7.9	0.38	0.01010	0.01011
7D	1500	18.5	7.9	0.07	0.00203	0.00203
8	1502	18.5	7.9	0.03	0.00090	0.00089
9A	1504	18.3	7.9	0.07	0.00178	0.00180
9B	1506	18.3	7.9	0.08	0.00223	0.00225
9C	1508	18.5	7.9	0.10	0.00271	0.00274
9D	1510	18.5	8.0	0.04	0.00141	0.00142
9E	1512	18.1	8.0	0.09	0.00302	0.00304
9F	1514	18.4	7.8	0.25	0.00556	0.00559
10A	1516	19.1	7.6	0.12	0.00180	0.00181
10B	1518	18.9	7.8	0.01	0.00019	0.00019
10C	1520	18.9	7.8	0.05	0.00111	0.00112
10D	1522	18.1	7.9	0.05	0.00132	0.00132
10E	1525	19.1	8.1	0.06	0.00257	0.00258

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #55A

DATE: 9/25/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1400	18.2	8.2	0.13	0.00688	0.00705
1B	1405	18.0	8.2	0.10	0.00509	0.00520
1C	1410	17.3	8.2	0.09	0.00444	0.00453
1D	1420	17.3	8.2	0.10	0.00484	0.00491
1E	1425	17.1	8.1	0.13	0.00511	0.00517
1F	1430	17.4	8.2	0.16	0.00813	0.00821
2	1350	22.8	7.0	11.52	0.05578 STP	
3A	1520	19.1	8.3	0.12	0.00852	0.00852
3B	1522	N/A	N/A	N/A	INSUFFICIENT DATA	
3C	1525	N/A	N/A	N/A	INSUFFICIENT DATA	
4	1530	19.0	7.9	0.10	0.00281	0.00281
5A	1533	18.8	8.2	0.11	0.00583	0.00611
5B	1535	19.0	8.2	0.16	0.00864	0.00905
5C	1540	18.9	8.2	0.16	0.00903	0.00946
5D	1544	19.2	7.9	0.16	0.00475	0.00499
5E	1550	18.7	8.2	0.18	0.00979	0.01026
5F	1555	18.5	8.1	0.12	0.00529	0.00555
5G	1605	18.9	8.2	0.19	0.01038	0.01088

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

WEEK #55B

DATE: 9/29/79

STATION NUMBER	TIME	TEMPERATURE, DEG.C	PH	TOTAL AMMONIA,MG/L (NH3 AS N)	UN-IONIZED AMMONIA, MG/L (NH3 AS N)	TIME ADJUSTED UN-IONIZED AMMONIA, MG/L (NH3 AS N)
1A	1330	17.4	7.6	0.07	0.00095	0.00099
1B	1340	17.1	7.7	N/A	INSUFFICIENT DATA	
1C	1345	16.3	7.6	0.07	0.00078	0.00081
1D	1350	16.2	7.6	0.09	0.00107	0.00110
1E	1355	16.3	7.7	0.04	0.00061	0.00063
1F	1400	16.8	7.7	0.07	0.00102	0.00104
2	1320	21.5	6.8	13.65	0.03805 STP	
3A	1600	17.4	8.0	0.12	0.00366	0.00366
3B	1605	17.2	8.1	0.07	0.00289	0.00289
3C	1610	17.2	8.0	0.07	0.00206	0.00206
4	1415	17.9	7.9	0.22	0.00584	0.00614
5A	1615	17.2	8.0	0.04	0.00129	0.00135
5B	1620	17.2	7.9	0.07	0.00165	0.00173
5C	1625	17.3	7.8	0.07	0.00149	0.00156
5D	1630	17.3	8.0	0.09	0.00285	0.00299
5E	1640	17.3	8.0	N/A	INSUFFICIENT DATA	
5F	1645	17.0	8.0	0.07	0.00228	0.00240
5G	1650	17.1	7.9	0.18	0.00449	0.00472
6	1445	18.6	8.2	N/A	INSUFFICIENT DATA	
7A	1447	17.0	7.8	0.18	0.00356	0.00358
7B	1450	17.2	7.9	0.04	0.00103	0.00103
7C	1455	17.2	7.6	0.06	0.00073	0.00073
7D	1500	17.7	7.1	0.09	0.00038	0.00038
8	1502	18.8	7.9	0.07	0.00208	0.00204
9A	1505	17.7	7.9	N/A	INSUFFICIENT DATA	
9B	1507	17.3	7.6	0.07	0.00084	0.00085
9C	1509	17.2	7.7	0.20	0.00314	0.00317
9D	1512	17.2	7.9	0.07	0.00165	0.00166
9E	1514	17.1	7.9	0.11	0.00266	0.00267
9F	1516	17.5	7.8	N/A	INSUFFICIENT DATA	
10A	1518	18.3	7.9	N/A	INSUFFICIENT DATA	
10B	1520	18.4	7.7	N/A	INSUFFICIENT DATA	
10C	1522	17.9	7.7	0.09	0.00152	0.00152
10D	1523	17.1	7.7	0.07	0.00117	0.00117
10E	1525	17.2	7.9	0.06	0.00144	0.00144

NOTE: * INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH GREATER THAN OR EQUAL TO 8.5
** INDICATES UN-IONIZED AMMONIA CONCENTRATION IN RIVER GREATER THAN 0.02 MG/L
AND PH LESS THAN 8.5
IF TEMPERATURE LESS THAN 5.0 DEGREES C THEN UN-IONIZED AMMONIA CALCULATED AT 5.0 DEGREES C

APPENDIX B

ADDITIONAL HYDROLOGIC DATA

Table B.1 USGS and LRCWE Discharges
Figure B.1 Rating Curve for Colorado River at Broadway Bridge
Figure B.2 Rating Curve for Colorado River at Hwy. 340 near Fruita
Figure B.3 Discharge vs. Gauge Height, Persigo Wash at Interstate 70
Figure B.4 Discharge vs. Gauge Height, Little Salt Wash at U.S. Hwy. 6
Figure B.5 Rating Curve for V-Notch Weir at Fruita Lagoon
Figure B.6 Colorado River at Persigo Wash, North Channel
Figure B.7 Rating Curve for North Channel, Colorado River Upstream of Persigo Wash
Figure B.8 Colorado River Flows Upstream of Persigo Wash

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Table B.1a

USGS AND LRCWE DISCHARGES
Converted from cfs

	USGS (1)		LRCWE		USGS (1)
Date	Colorado River near Cameo m^3/s	Gunnison River near Grand Jct. m^3/s	Broadway Bridge (gauged) m^3/s	Highway 340 near Fruita (gauged) m^3/s	Colorado River near State Line m^3/s
9/07/78	49 (2)	31 (2)	30	40	69 (2)
10/10/78	48 (3)	38 (4)	25	50	67
11/13/78	55 (5)	28 (6)	100	115 (7)	142
12/11/78	-	62 (8)	-	-	89 (8)
1/22/79	-	-	90	110	-
2/15/79	-	-	125	150	-
3/12/79	-	-	120	140	150
4/09/79	-	-	135	160	200
5/15/79	-	-	235	275	300
6/12/79	-	-	505	510	566
7/17/79	-	-	240	270	200
8/14/79	-	-	55	85	101
8/22/79	-	-	95	120	142
8/29/79	-	-	60	90	114
9/05/79	-	-	40	75	93
9/12/79	-	-	50	80	96
9/19/79	-	-	50	75	105
9/26/79	-	-	50	75	105

NOTES:

(1) Preliminary data, except where noted
(2) Published data
(3) 10/11/78 - gauged
(4) 10/04/78 - gauged
(5) 11/14/78 - gauged
(6) 11/15/78 - gauged
(7) Estimated
(8) 12/13/78 - gauged

Table B.1b

USGS AND LRCWE DISCHARGES

	USGS (1)		LRCWE		USGS (1)
Date	Colorado River near Cameo cfs	Gunnison River near Grand Jct. cfs	Broadway Bridge (gauged) cfs	Highway 340 near Fruita (gauged) cfs	Colorado River near State Line cfs
9/07/78	1730 (2)	1100 (2)	1000	1500	2440 (2)
10/10/78	1700 (3)	1330 (4)	900	1700	2380
11/13/78	1950 (5)	973 (6)	3500	4000 (7)	5030
12/11/78	-	2180 (8)	-	-	3125 (8)
1/22/79	-	-	3200 (7)	3900	-
2/15/79	-	-	4500	5400	-
3/12/79	-	-	4300	4900	5280
4/09/79	-	-	4700	5700	7070
5/15/79	-	-	8300	9800	10600
6/12/79	-	-	17800	18000	20000
7/17/79	-	-	8400	9500	7050
8/14/79	-	-	2000	3000	3580
8/22/79	-	-	3300	4300	5020
8/29/79	-	-	2100	3200	4040
9/05/79	-	-	1400	2600	3290
9/12/79	-	-	1700	2700	3400
9/19/79	-	-	1800	2700	3690
9/26/79	-	-	1800	2600	3710

NOTES:
(1) Preliminary data, except where noted
(2) Published data
(3) 10/11/78 - gauged
(4) 10/04/78 - gauged
(5) 11/14/78 - gauged
(6) 11/15/78 - gauged
(7) Estimated
(8) 12/13/78 - gauged

FIGURE B.1.

RATING CURVE FOR COLORADO RIVER AT BROADWAY BRIDGE

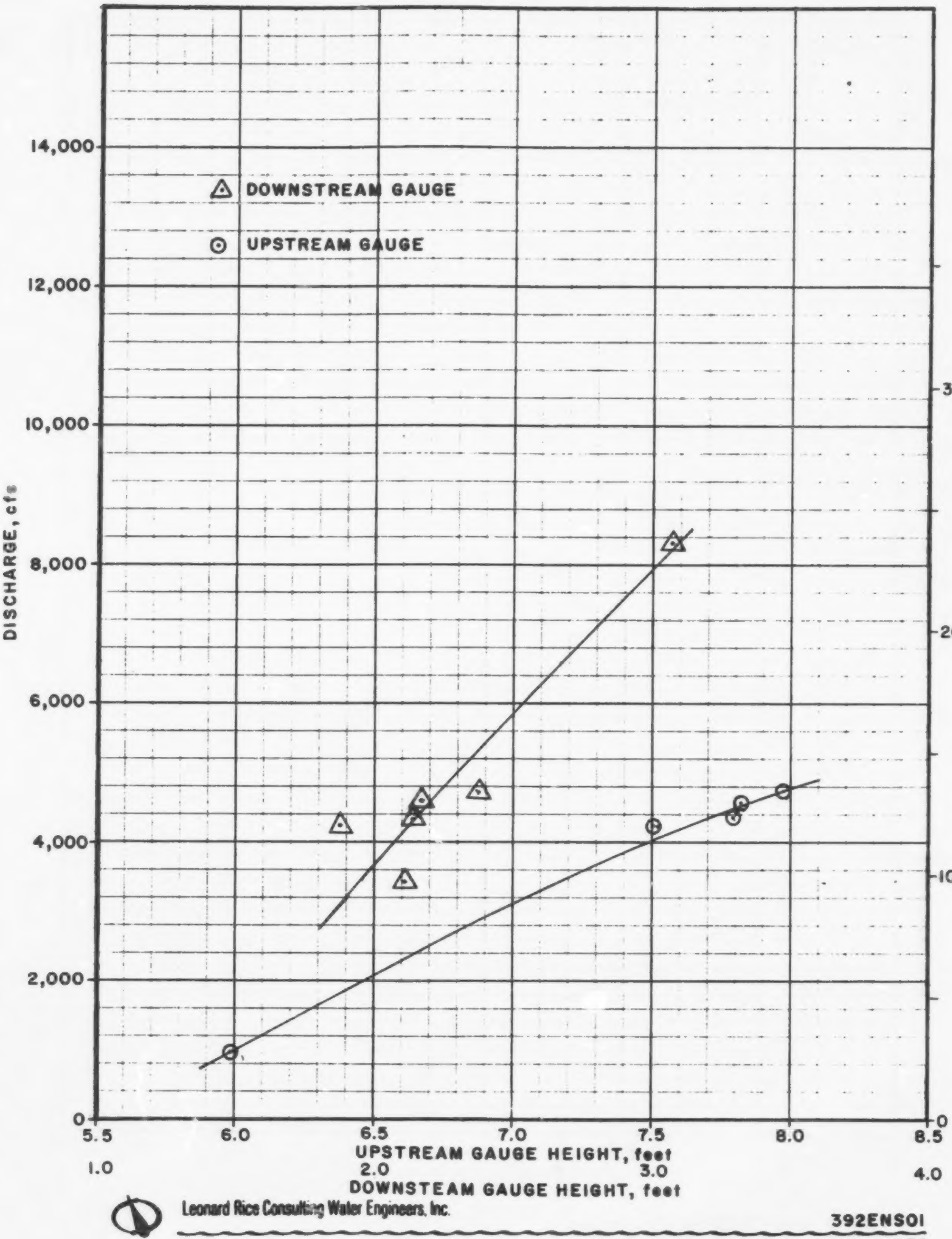

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FIGURE B.2.

RATING CURVE FOR COLORADO RIVER AT HWY. 340 NEAR FRUITA

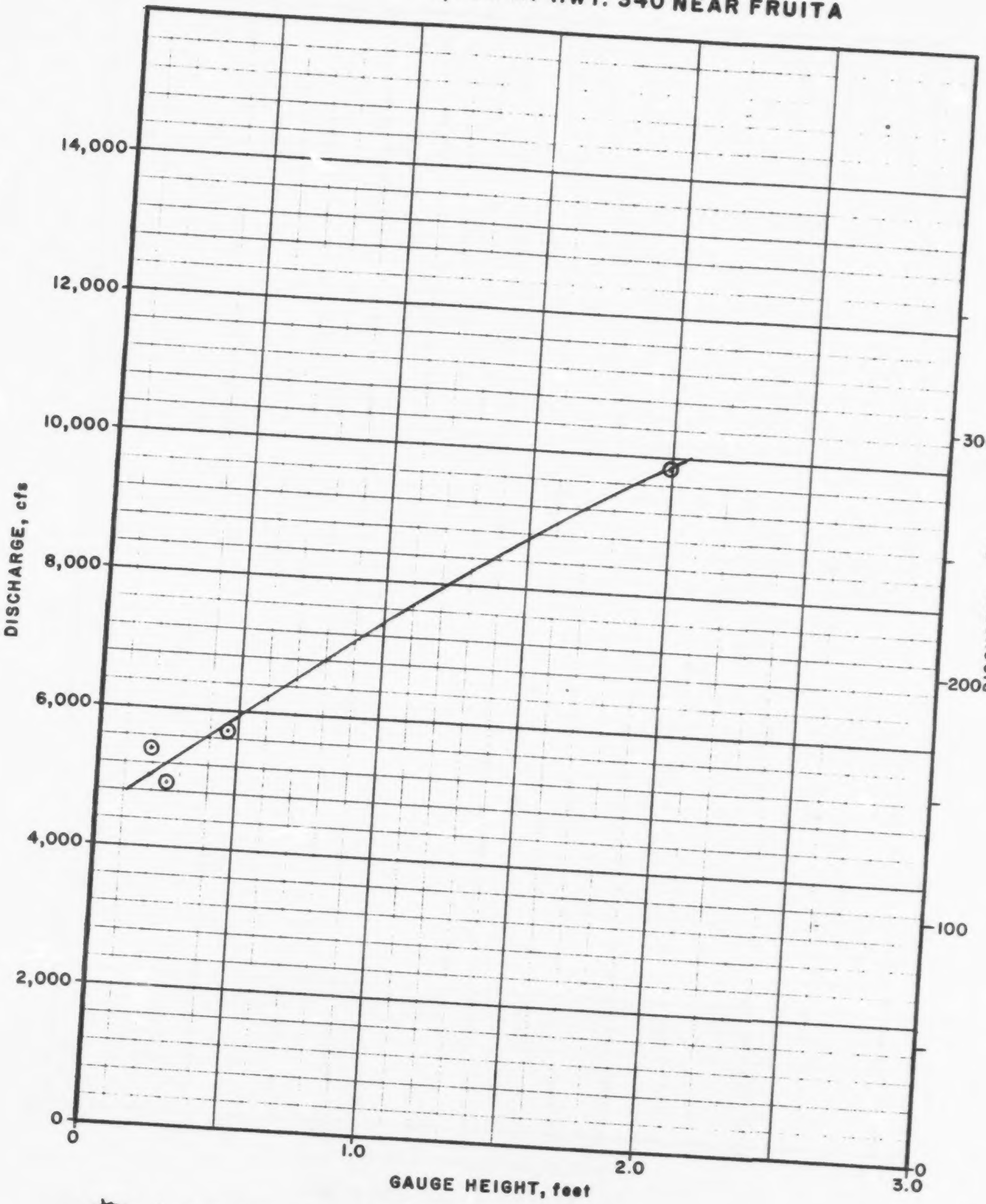

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FIGURE B.3.

DISCHARGE VS. GAUGE HEIGHT

PERSIGO WASH AT INTERSTATE 70

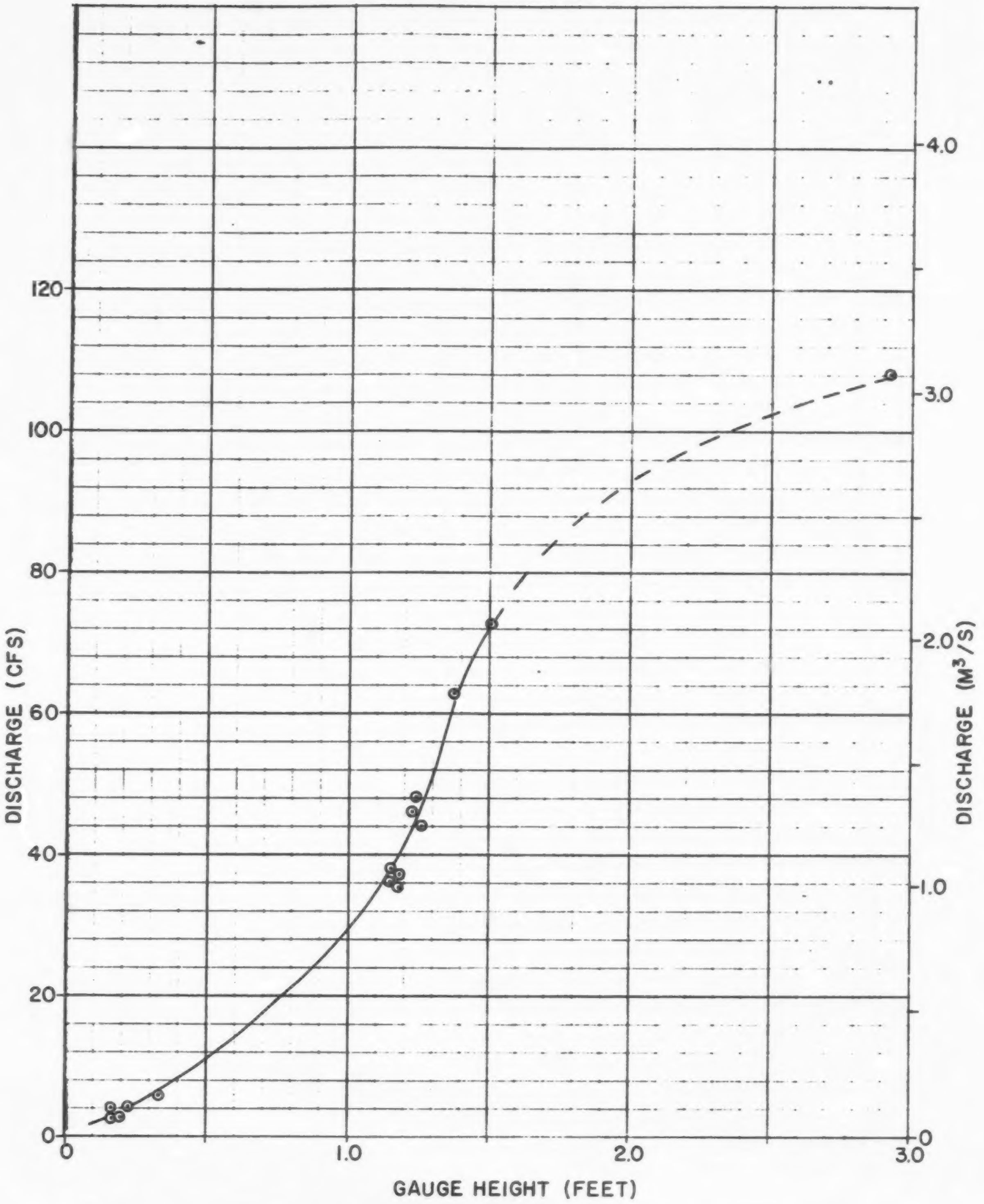

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FIGURE B.4.

DISCHARGE VS. GAUGE HEIGHT

LITTLE SALT WASH AT U.S. HWY. 6

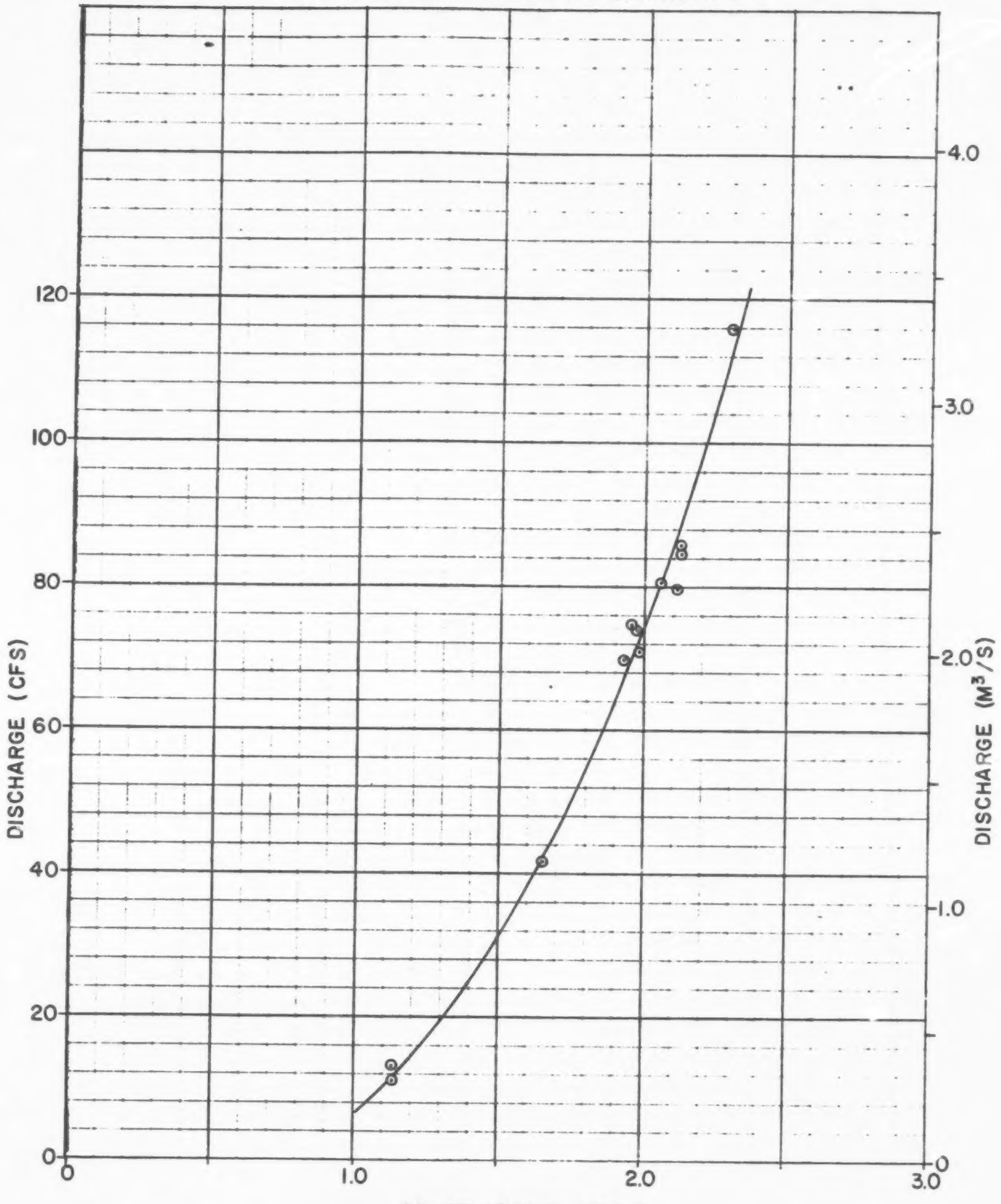

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FIGURE B.5

RATING CURVE FOR
V-NOTCH WEIR AT FRUITA LAGOON

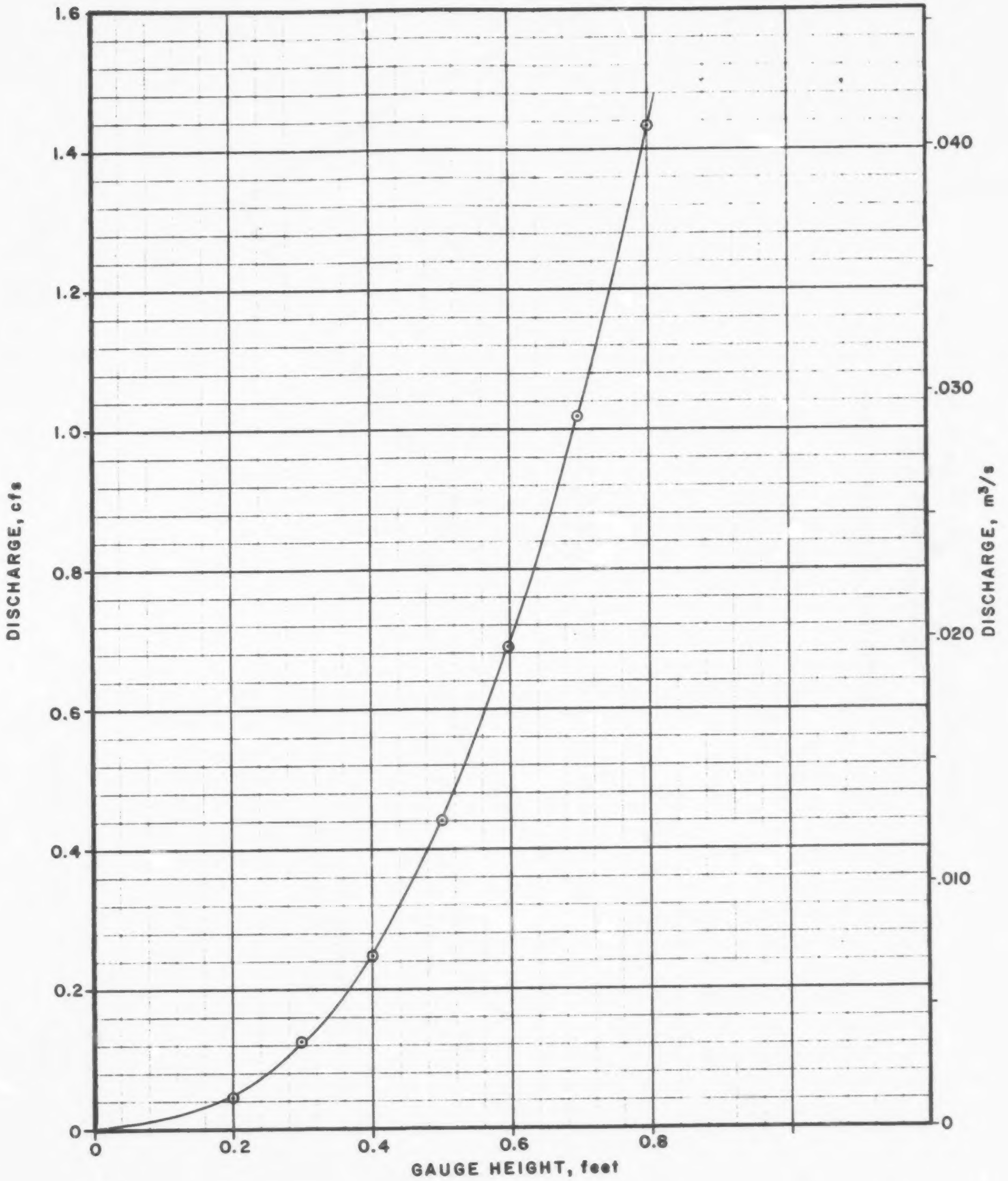

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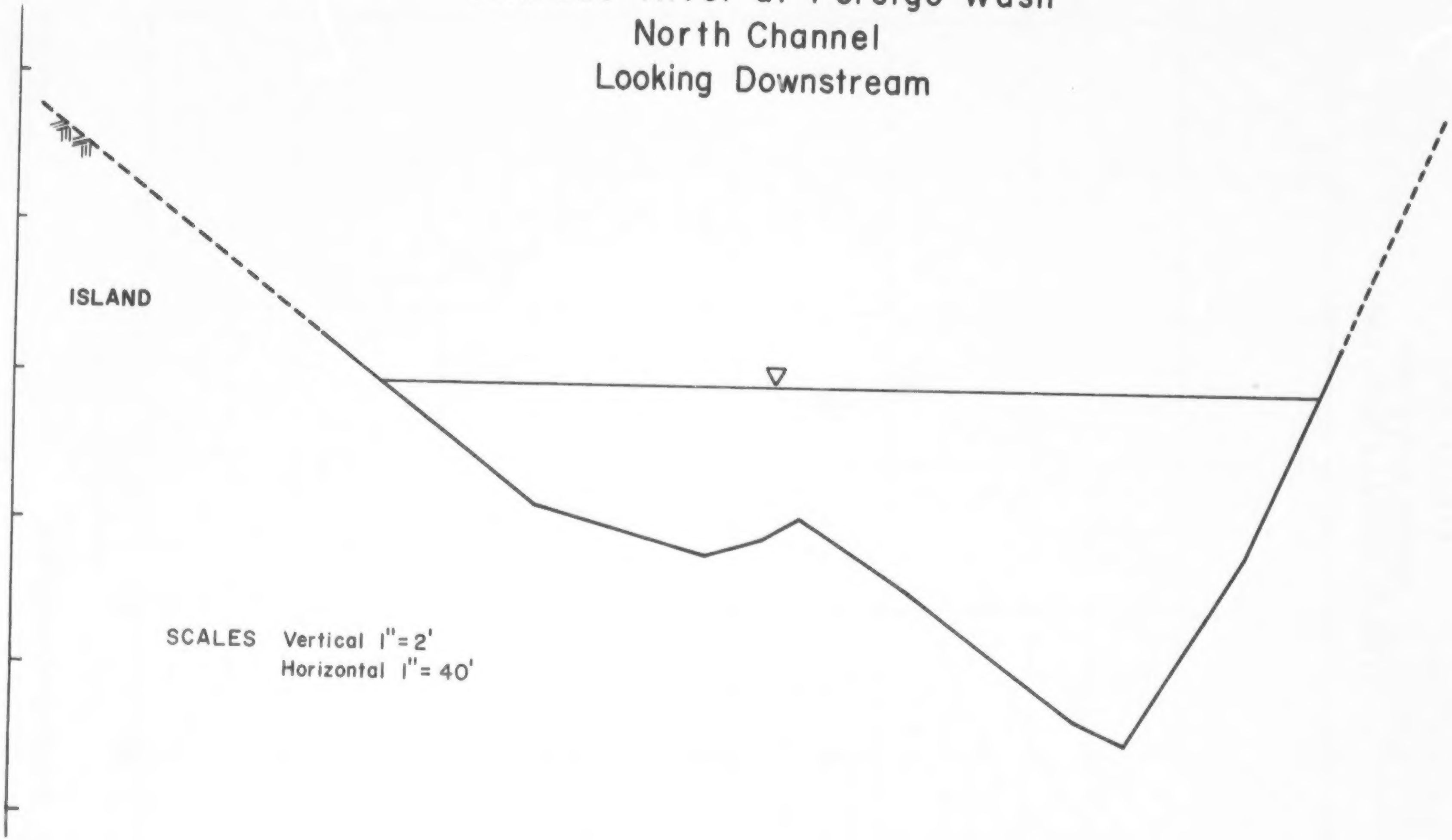
FIGURE B.6

Colorado River at Persigo Wash
North Channel
Looking Downstream



SCALES Vertical 1" = 2'
Horizontal 1" = 40'

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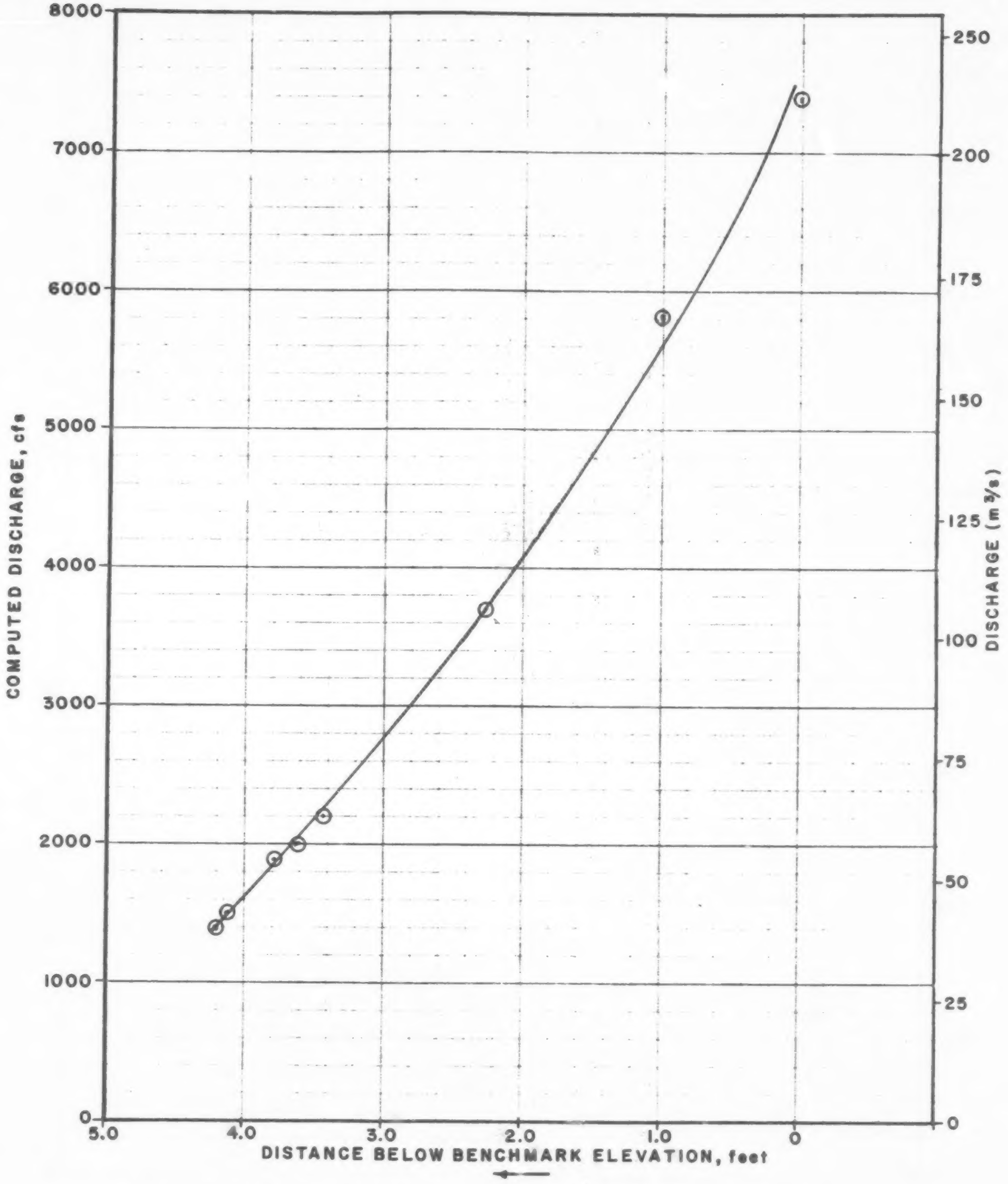
FIGURE B.7

RATING CURVE FOR NORTH CHANNEL COLORADO RIVER UPSTREAM OF PERSIGO WASH



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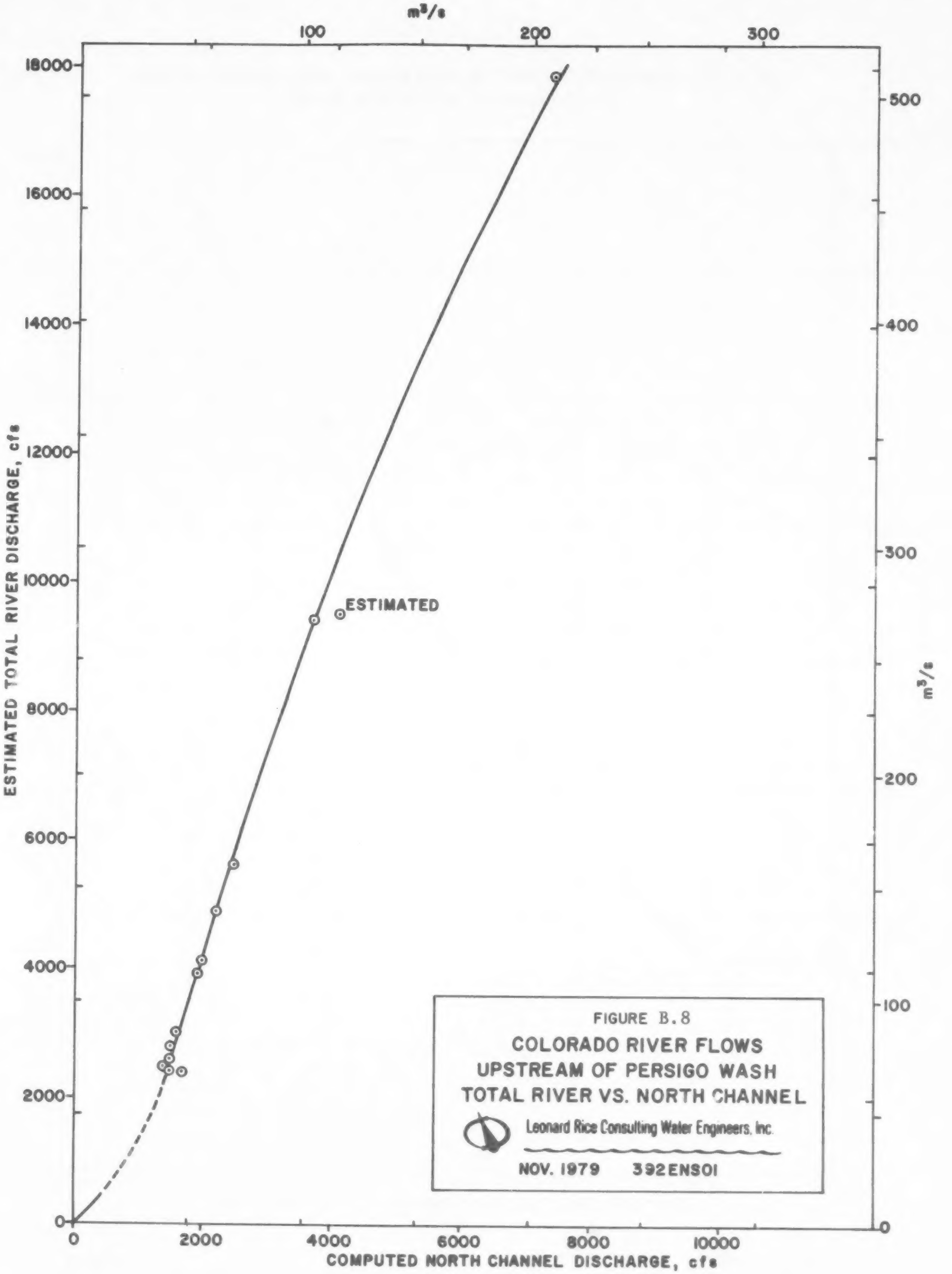

FIGURE B.8

COLORADO RIVER FLOWS
UPSTREAM OF PERSIGO WASH
TOTAL RIVER VS. NORTH CHANNEL

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APPENDIX C

SAMPLE CALCULATION FOR AMMONIA LOADING ALLOCATIONS

APPENDIX C

SAMPLE CALCULATION FOR AMMONIA LOADING ALLOCATIONS

For the month of November, representative background conditions for Grand Junction are:

Temperature = 10°C
pH = 8.3
Background Total Ammonia = 0.18 mg/l
Flow (whole river) = 67,700 l/s

At this temperature and pH, 3.58 percent of the total ammonia is in the un-ionized form on the basis of equilibrium relationships. Thus, if the concentration of un-ionized ammonia is at the maximum (equal to the EPA criterion of 0.02 mg/l), then the total ammonia would be 0.56 mg/l. This is the maximum allowable in-stream concentration of total ammonia under these conditions.

The permissible ammonia loading rate is then determined as follows:

(Maximum in-stream ammonia - Background ammonia) x (Flow), or

(0.56 mg/l - 0.18 mg/l) x (67,700 l/s) = 25,726 mg/s

or about 2,200 kg/day.

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APPENDIX D

DYE TRACER STUDY

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APPENDIX D

DYE TRACER STUDY

BACKGROUND

As part of the ammonia toxicity study, a bio-degradable fluorescent dye was injected into two tributary washes to determine mixing patterns in the river during summer low-flow conditions. The locations of the dye injections were chosen to approximate the proposed sites for future wastewater discharges of the two cities. The dissolved dye can be reasonably assumed to simulate the behavior of ammonia present in wastewater effluent, and the resulting mixing characteristics will be used to predict the dilution patterns of ammonia.

PROCEDURE

On 9 and 10 August 1978, Rhodamine WT dye was pumped continuously, at a constant rate, respectively, into Little Salt Wash and Persigo Wash. When the dye was completely mixed in the wash and the dye plume had achieved a steady-state condition in the river, after about 45 minutes, water samples from the river were measured for fluorescence at various downstream locations. Grab samples were collected along transects across the river, from the boat and by wading. Water temperatures were also measured, and visual observations were noted. A fluorometer and generator were carried on board the boat so that samples could be measured immediately following collection. Calibration measurements were performed periodically using prepared solutions of known Rhodamine concentrations to insure accuracy of data. Aerial photography

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was conducted simultaneously on both days for concurrent qualitative assessment of the mixing zones.

Resolution of Data

There were a few minor differences in the two dispersal studies. At Little Salt Wash, dye was injected at about one half the concentration of that used at Persigo Wash and for twice the length of time. Farthest downstream sampling locations were about 4,200 m (13,000 ft) from the mouth of Little Salt Wash, compared to about 2,400 m (7,500 ft) for Persigo Wash. Also, aerial photographs were taken at a higher altitude--and lower resolution--for Little Salt Wash. The effort at Little Salt Wash served to refine details of procedures used the next day at Persigo Wash. Thus, data for Persigo Wash are more detailed and have higher resolution than those for Little Salt Wash.

DISCUSSION

On the basis of fluorometer readings and calibration data, dilution of dye at downstream locations was calculated, as shown on Tables D.1 and D.2. All dilutions were determined relative to the concentration of dye in the completely mixed water flowing from the wash. For the Persigo Wash study, dilutions ranged from 1 to 400; for the Little Salt Wash study, dilutions ranged from 1 to 100, since dye was injected at a lower concentration. However, for both studies, values approaching the highest dilution are not precise due to increasing effects of background interference caused by factors such as river turbidity and slight variations in on-board power which resulted in instrument fluctuations.

Aerial photographs were used to interpolate between data points as well as to provide an approximate large-scale representation of the river. Superimposing the calculated dilution values on tracings of the aerial photographs produced graphic representations of the dye plumes for each study, as portrayed in Figures D.1 and D.2. Dilution ranges are shown in bands, and the path of the dye can be easily traced, especially at critical points where the river separates into more than one channel.

TABLE D.1

COLORADO RIVER DILUTIONS DOWNSTREAM OF PERSIGO WASH (DYE TRACER STUDY--10 AUGUST 1978)

Fluorometer readings and calculated concentrations and dilutions of Rhodamine WT dye are presented. Dye was continuously injected into Persigo Wash for approximately 2 hours, and grab samples were collected and measured for fluorescence when a steady-state condition was achieved. Calibrations were made using dye solutions of known concentrations in the same range as the samples. Concentrations and dilutions were calculated as follows:

$$C = \frac{C_c\ S_c}{F_c} \cdot \frac{F}{S}$$

$$D = \frac{C_o}{C}$$

where
C = sample concentration in ppm
F = sample fluorometer reading
S = sample instrument scale
C_c = calibration concentration in ppm
F_c = calibration fluorometer reading
S_c = calibration instrument scale
D = river dilution
C_o = concentration at mouth of wash = 0.120 ppm

Transect	Station (ft. from no. river bank)	Observations	Fluorometer Reading, F	Instr. Scale, S	Calibration Ratio, C_cS_c/F_c	Conc. in ppm C	Dilution D
0	-	Distinct pink plume 20' wide, current slower near no. bank	42*	3	(0.010)(3)/35	0.120	1
1	10	Samples by wading/swimming	36*	3	"	0.103	1.2
	20		42	1	"	0.036	3.3
	40		17	10	"	0.001	82.3
	60		8	30	(0.001)(30)/32	0.000	480.0
	70		8	30	"	0.000	480.0
2A	10	No. branch sampled by wading. Most of dye segregated within 50' from no. bank	57	1	(0.100)(1)/93	0.061	2.0
	20		44	1	"	0.047	2.5
	30		37	1	"	0.040	3.0
	40		41	3	"	0.015	8.2
	50		54	10	"	0.006	20.7
	60		67	30	(0.001)(30)/32	0.002	57.1
	70		38	30	"	0.001	100.0
	80		29	30	"	0.001	133.3
2B	10	So. branch, temp. 24°C	15	30	"	0.001	240.0
	20		12	30	"	0.000	320.0
	30		10	30	"	0.000	384.0
	40	Middle of flow	10	30	"	0.000	384.0
	60		10	30	"	0.000	384.0
	80	River width 100'	14	30	"	0.000	274.0
	90		14	30	"	0.000	274.0
2 1/2	10	Sampled by wading	47	1	(0.100)(1)/90	0.052	2.3

TABLE D. 1 (continued)

Transect	Station (ft. from no. river bank)	Observations	Fluorometer Reading, F	Instr. Scale, S	Calibration Ratio, C_cS_c/F_c	Conc. in ppm C	Dilution D
	20		40	1	"	0.044	2.7
	30		35	1	"	0.039	3.1
	40		30	1	"	0.033	3.6
	50		31	3	"	0.011	10.5
	60		21	10	"	0.002	51.4
	70		26	30	(0.001)(30)/28	0.001	129.2
3	10	River widens w/ some preferential channels	32	1	(0.100)(1)/90	0.035	3.4
	20		33	1	"	0.037	3.2
	30		33	1	"	0.037	3.2
	40		29	1	"	0.032	3.7
	50		31	1	"	0.034	3.5
	60		29	1	"	0.032	3.7
	70		23	1	"	0.025	4.7
	80		18	1	"	0.020	6.0
	90		67	10	"	0.007	16.1
	100		91	10	"	0.010	11.9
	110		55	10	"	0.006	19.6
	120		46	10	"	0.005	23.5
4	10		-	-	-	-	-
	20	Sluggish water, stagnant, temp. 24°C	43	3	"	0.016	7.5
	30		52	10	"	0.006	20.8
	40		41	10	"	0.005	26.3
	50		45	10	"	0.005	24.0
	60		31	10	"	0.003	34.8
	70		35	10	"	0.004	30.9
	80		41	10	"	0.005	26.3
	90		42	10	"	0.005	25.7
	100		45	10	"	0.005	24.0
	110		26	30	(0.001)(30)/28	0.001	129.0
	120		56	30	"	0.002	60.0
	130		15	30	"	0.001	224.0
	140		16	30	"	0.001	210.0
	160		9	30	"	0.000	373.3
	180	River 200' wide	7	30	"	0.000	480.0
5	10		27	3	(0.100)(1)/90	0.010	12.0
	20		14	3	"	0.005	23.1
	30	Temp.24.2°C	18	10	"	0.002	60.0
	40		11	10	"	0.001	98.2
	50		38	30	(0.001)(30)/28	0.001	88.4
	60		27	30	"	0.001	124.4
	70		27	30	"	0.001	124.4
	80		17	30	"	0.001	197.6
	90	Temp. 25°C	13	30	"	0.000	258.5
	100		14	30	"	0.001	240.0
	110		15	30	"	0.001	224.0

*Actual sample 10x more concentrated

NOTE: Concentrations are expressed to three significant figures, although dilutions are calculated from more precise figures.

TABLE D.2

COLORADO RIVER DILUTIONS
DOWNSTREAM OF LITTLE SALT WASH
(DYE TRACER STUDY--9 AUGUST 1978)

Fluorometer readings and calculated concentrations and dilutions of Rhodamine WT dye are presented. Dye was continuously injected into Little Salt Wash for approximately 4 hours, and grab samples were collected and measured for fluorescence when a steady-state condition was achieved. Calibrations were made using dye solutions of known concentrations in the same range as the samples. Concentrations and dilutions were calculated as follows:

$$C = \frac{C_c S_c}{F_c} \cdot \frac{F}{S}$$

$$D = \frac{C_o}{C}$$

where C = sample concentration in ppm
F = sample fluorometer reading
S = sample instrument scale
C_c = calibration concentration in ppm
F_c = calibration fluorometer reading
S_c = calibration·instrument scale
D = river dilution
C_o = concentration at mouth of wash = 0.057 ppm

Transect	Station	Observations	Fluorometer Reading, F	Instr. Scale, S	Calibration Ratio, C_cS_c/F_c	Conc. in ppm C	Dilution D
0	-	Distinct pink path, about 20' wide, temp. 23°C	63	1	(0.020)(3)/66	0.057	1
1	10		47	3	"	0.014	4.0
	25		38	10		0.003	16.6
	50		6	10		0.001	105.0
	100	Mid-river	6	10		0.001	105.0
	150		7	10		0.001	90.0
2	5	North bank current much slower	80	10	(0.02)(3)/66	0.007	7.9
	25		33	10	"	0.003	19.1
	50		10	10	"	0.001	63.0
	100	River about 300' wide	6	10	"	0.001	105.0
	200		7	10	"	0.001	90.0
	250		8	10	"	0.001	78.8
	275		8	10	"	0.001	78.8
3A	10	North channel temp. 22°C	81	30	(0.001)(30)/33	0.002	23.3
	20	1/3 of channel width	87	30	"	0.003	21.7
	40	2/3 of channel width	88	30	"	0.003	21.5
3B	15	South channel, rapid flow, shallow	37	10	(0.02)(3)/66	0.003	17.0
	30		13	10	"	0.001	48.5
	45		6	10	"	0.001	105.0
4	5	Temp. 23.5°C	68	30	(0.001)(30)/33	0.002	27.8
	A	1/4 river	53	30	"	0.002	35.7
	B	Mid-river	21	30	"	0.001	90.0
	C	3/4 river	12	30	"	0.000	157.5

TABLE D.2 (continued)

Transect	Station	Observations	Fluorometer Reading, F	Instr. Scale, S	Calibration Ratio, C_cS_c/F_c	Conc. in ppm C	Dilution D
5	A		46	30	"	0.001	41.1
	B		24	30	"	0.001	78.8
	C		18	30	"	0.001	105.0
6	A	Upstream of small channel	11	10	"	0.001	44.8
	B	Mouth of small channel	11	10	"	0.001	44.8
7	A	West side of north channel	35	30	"	0.001	54.0
	B	East side of south channel	31	30	"	0.001	61.0

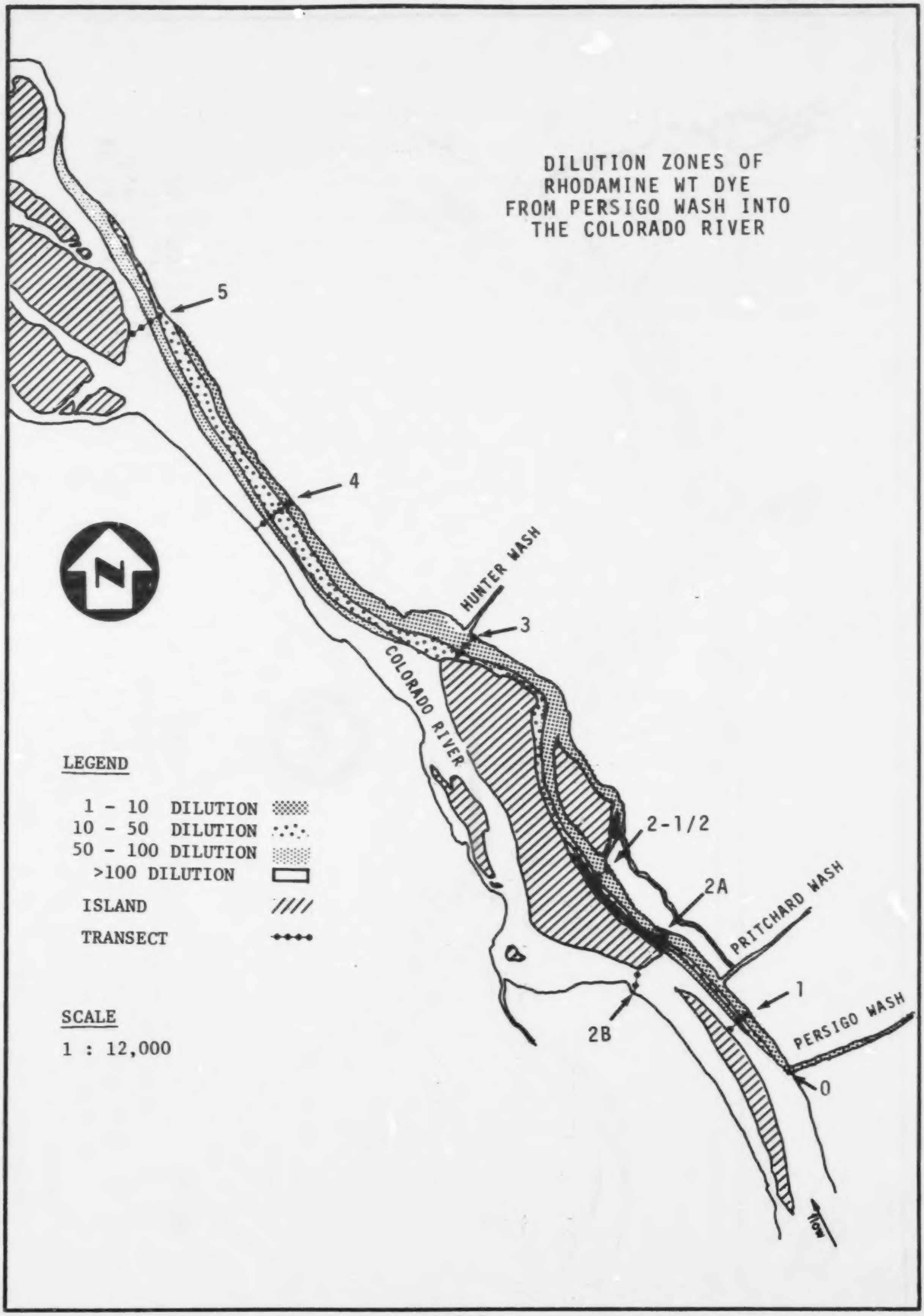
NOTE: Concentrations are expressed to three significant figures, although dilutions are calculated from more precise figures.

At Persigo Wash, complete mixing with the river water occurs at about 2,300 m (7,000 ft) downstream of the wash. Dyed water from the wash enters the river from the north and remains in a narrow band, segregated from the main flow of the river for the first 200 m (600 ft). Visually, the dye appears to "hug" the north bank of the river. Very little mixing occurs in this zone. At this point, Pritchard Wash (smaller than Persigo) enters the Colorado River, and the band of dye-influenced water widens from about 10 m to 20 m (30 ft to 60 ft). Dilutions in the 20-m (60-ft) band range from 2- to 20-fold. At 400 m (1,300 ft) downstream from Persigo Wash, an island separates the river into two channels. The dye continues to hug the north bank of the north channel with a 2- to 50-fold dilution, and virtually none of the dye passes into the south channel. At the downstream end of the island, about 800 m (2,500 ft) away, the dye passes through a narrow point in the north channel. Beyond the island, Hunter Wash, which is larger than Persigo Wash, enters the river and mixing occurs fairly rapidly from this point onward. Dilutions greater than 20-fold are achieved for 90 percent of the river width in the next 600 m (1,800 ft). Mixing can be considered complete for all practical purposes before the next set of islands at 2,300 m (7,000 ft) downstream of Persigo Wash.

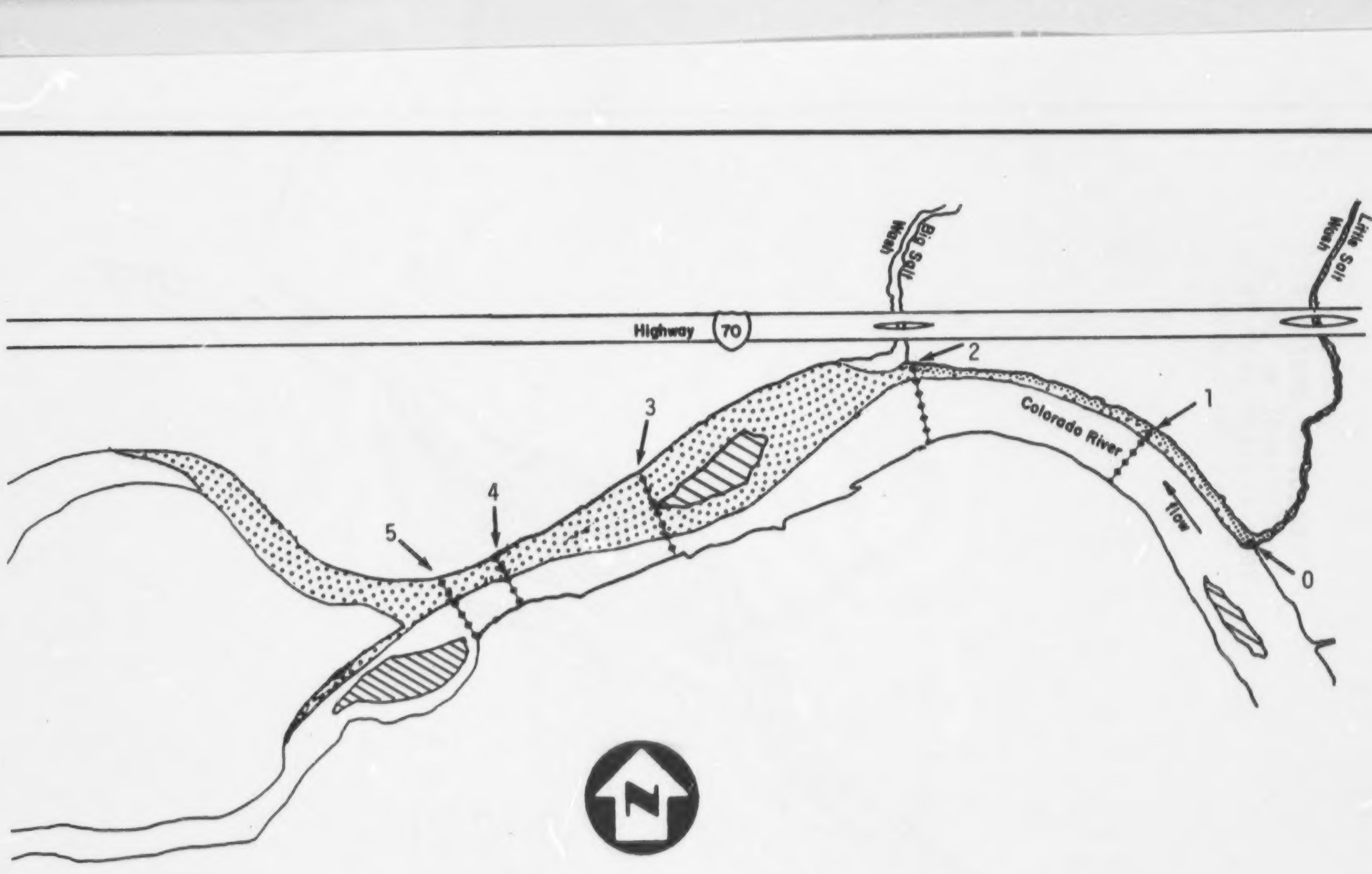
At Little Salt Wash, mixing is essentially complete at 1,500 m (4,500 ft) downstream from the wash. In this reach of the Colorado River, there are fewer islands to obstruct mixing, and Big Salt Wash contributes a significant volume of water which accelerates dilution. Again, the dye plume exhibits very little mixing with the main flow in the initial 600 m (1,800 ft), with a 5-m (15-ft) band of less than 10-fold dilution. At the mouth of Big Salt Wash, increased mixing is visually evident; and only 100 m (300 ft) downstream of Big Salt Wash, the dye path extends across more than one half the river width (about 120 m) with dilutions greater than 20-fold. Complete mixing occurs at points 700 m (2,100 ft) farther downstream.

The results of the dye tracer study help predict the mixing behavior of ammonia from wastewater discharges during the critical months of summer low flow. Areas in the river where minimal mixing occurs will have to be considered in establishing discharge concentrations of ammonia. This would assure a safe habitat for the endangered fishes throughout the river width. In addition, these results may also serve as a basis for recommendation of an outfall-diffuser which could provide faster and greater dispersion than the natural flow of the washes into the river.

FIGURE D.1


DILUTION ZONES OF
RHODAMINE WT DYE
FROM PERSIGO WASH INTO
THE COLORADO RIVER

5
4
HUNTER WASH
3
COLORADO RIVER
2-1/2
2A
PRITCHARD WASH
1
PERSIGO WASH
0
2B
flow
N
LEGEND
1 - 10 DILUTION
10 - 50 DILUTION
50 - 100 DILUTION
>100 DILUTION
ISLAND
TRANSECT
SCALE
1 : 12,000


Little Salt Wash
Big Salt Wash
Highway 70
Colorado River
flow
0
1
2
3
4
5

LEGEND

1 - 10 DILUTION ▓
10 - 50 DILUTION ░
>50 DILUTION ▭
ISLAND ▨
TRANSECT ✦✦✦✦

SCALE

1 : 9,500

DILUTION ZONES OF
RHODAMINE WT DYE
FROM LITTLE SALT WASH
INTO THE COLORADO RIVER

APPENDIX E

INTENSIVE SURVEYS

APPENDIX E

INTENSIVE SURVEYS

INTRODUCTION

To establish diurnal variations of the concentration of un-ionized ammonia, repeated water sampling was conducted throughout the course of one day at critical locations. These repeated samplings, or intensive surveys, were performed twice during the thirteen-month study period--once each during the summer and winter low-flow periods--to look for any correlations as well as to determine seasonal differences in the diurnal patterns.

PROCEDURE

Intensive surveys were conducted at two locations: (1) in the vicinity of the proposed Grand Junction wastewater treatment facility, Stations 3, 4 and 5; and (2) in the vicinity of the existing and proposed-to-be-expanded wastewater treatment facility at Fruita, Stations 7, 8 and 9. Stations 4 and 8, located at Persigo Wash and Little Salt Wash, respectively, represent the receiving waters for the treated effluents as well as agricultural runoff; Stations 3 and 7 are upstream locations on the river; and Stations 5 and 9 are on the river downstream of the washes.

For both the summer and winter intensive surveys, flow was gaged once at each site, and all water samples were analyzed for pH, temperature and total ammonia. These data enabled the calculation of concentrations of un-ionized ammonia at all sampling sites throughout one day during the low-flow periods.

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Timing of the low-flow periods for the current year was determined in two steps. First, stream gaging records for the Colorado River near Cameo, 38 km (24 mi) upstream of the study area, and near the Utah state line, 45 km (28 mi) downstream, were analyzed for the water years 1951 to 1976; average timing and expected trends were thus established. With this information, the second step was to measure daily river stage during the expected weeks of low flow and to watch closely the declining river stage measurements. The time at which the river stage rose for two consecutive days was considered to be an accurate indication of the low-flow period.

SUMMER LOW FLOW

Historical Records

The following are summaries of trends indicated during an analysis of historical records.

(1) Summer low flows are not very distinct at the Cameo gage. Generally the low appears as a small dip in a generally declining seasonal discharge. The average low-flow date is 1 September.

(2) Summer low flows are more distinct at the gage near the Utah border, but still they are not as noticeable as in the winter. The average date is 12 September. The later date is attributable to delayed irrigation return flows and to the influence of the Gunnison River.

(3) There is a general relationship between the accumulation of winter snowpack and the timing of the summer low flows. With greater snowpack and the resulting greater runoff volume, the spring runoff lasts longer and the low-flow date tends to occur later. With less snowpack and the resulting lower runoff volume, the spring runoff does not last as long and the low-flow date generally

occurs earlier. The relation is not well defined, and it is affected by average temperatures.

(4) The snow melt which accumulated prior to the 1978 runoff season in the Colorado River Basin was above average. The Soil Conservation Service estimated that the April to September runoff near Cameo would be 122 percent of average.

(5) Summer low flows do not remain low over an extended period of time. In the analysis of the flows one week on either side of the low-flow date for the gaging station near the Utah state line, flows averaged 33 percent higher than the low-flow date for the week before and 40 percent higher for the week after.

Results

From daily river stage measurements taken from 23 August to 7 September 1978 at the Grand Avenue Bridge in Grand Junction, the 1978 summer low-flow period was determined to occur at about 5 to 8 September. Since this coincided with the start of the thirteen-month monitoring program, the summer intensive survey, conducted on 7 and 8 September, unfortunately, served as the test run for the sampling procedures. An unexpected electrical storm on the afternoon of the first day, together with inexperience with local river conditions, resulted in the acquisition of only two sets of samples rather than the planned six. Nevertheless, morning and afternoon samples were obtained at the required sites for the intensive survey, and flows were measured as planned. Collected water quality data are shown under Week Number 1 in Appendix A, and measured flows for each station are presented in Section 3.

At all stations, water temperatures increase from morning to afternoon, as expected. River temperatures vary from about 2.0 to 2.5°C from 8:00 a.m. until 7:00 p.m.; temperatures in Persigo and Little Salt washes show greater variation than in the river (about 4°C), due to smaller flows. Measurements of pH vary from 0.1 to 0.2 pH units, with similar variations in both the washes and the river. Variations in total ammonia concentration are not as consistent as those in temperature and pH. In general, concentration of total ammonia increases from morning to afternoon in the washes (Stations 4 and 8) and at the downstream stations (5 and 9); while at upstream sites (Stations 3 and 7), concentrations remain fairly constant. Stations 5 and 9 show the most erratic variations in total ammonia across the transect. In most cases, concentration of total ammonia ranges from 0.25 to 0.60 mg/ℓ as NH_3-N, but occasionally jumps as high as 1.60 mg/ℓ at one downstream location (Station 5C).

Calculations of un-ionized ammonia concentration show a definite increase from morning to afternoon for all sampling points. Nearly all morning samples, which were taken between 8:00 and 11:00 a.m., and all late afternoon samples exhibit un-ionized ammonia concentrations in excess of the 0.02 mg/ℓ as NH_3-N criterion recommended by the U.S. Environmental Protection Agency.

WINTER LOW-FLOW

Historical Records

From an examination of stream gaging records upstream and downstream of the study area for the period 1951 to date, the following trends are noted:

(1) At both gages, the lowest flow of the year generally occurs between mid-December and the end of February. though sometimes as late as March.

(2) At the Utah state line station, the average date for low-flow during those years is 24 January, and the date for the upstream station is usually within about one day.

(3) Since the 1978-79 winter was much colder and more severe than usual, the winter low-flow was somewhat delayed.

Results

River stage levels at the Grand Avenue Bridge in Grand Junction were measured daily from 25 January through the end of February. The data indicate that the winter low-flow may have occurred on 31 January. However, due to the difficulty in distinguishing between daily fluctuations and long-term trends, no definite trend was evident. The winter intensive survey was conducted on 15 and 16 February. Six samples were taken at each sampling point throughout the day at 1-1/2 to 1-3/4 hour intervals. Temperature and pH were measured immediately following collection; samples were then acidified and sent to the ES Berkeley laboratory for analysis of total ammonia. The flows given in Section 3 are a result of one measurement at each site during the survey. Collected data are presented in Appendix A, identified as Week Number 23.

Temperature--River temperature varies by about 3°C (from 1° to 4°C) at all points across the transects throughout the day, peaking and then leveling off at between 3:00 to 4:00 p.m. Temperature in Persigo and Little Salt washes fluctuates more than the river temperature (about 5°C), and peaks about an hour earlier than the river and falls off much more rapidly. Downstream river stations closest to the north bank (same bank as the washes) are most similar in temperature variation pattern to the washes.

pH--At all stations, pH values increased throughout the day, ranging from 7.1 to 8.4. At Stations 3 and 5, pH varied by 1 unit from morning to evening, reaching a maximum of 8.0 at about 3:00 p.m. and maintaining it through late afternoon. Station 4, Persigo Wash, exhibits the lowest observed pH of 7.1, which occurs in the early morning; otherwise, pH trends are similar to those of Stations 3 and 5. At Stations 7 and 9, upstream and downstream of Little Salt Wash, pH increases from about 7.6 to 8.0 during the day, with the primary peak occurring at about 3:00 p.m. and a secondary peak occurring at about 10:30 a.m. At all sampling points for Stations 7 and 9 there is a noticeable drop in pH about noon. Station 8, Little Salt Wash, follows the same pH pattern as Stations 7 and 9, although the range of pH variation is higher.

Total Ammonia--Concentration of total ammonia shows no definite pattern during the course of a day with relation to time, distance across a transect, or distance downstream. Only Station 8, at which ammonia concentration was 2 to 10 times higher, exhibits an upward trend from morning to evening. Generally, the observed concentrations range between 0.1 and 0.3 mg/ℓ NH_3-N, though concentrations as low as 0.016 mg/ℓ and as high as 1.2 mg/ℓ NH_3-N also occur.

Un-ionized Ammonia--At all but one sampling point, concentrations of un-ionized ammonia show a definite increase through the course of a day. All concentrations are lower than the concentrations measured during the summer intensive survey as well as significantly below the EPA criterion of 0.02 mg/ℓ NH_3-N. There is a slight correlation between un-ionized ammonia concentration and total ammonia in terms of hourly fluctuations, but the overall trend from morning to evening appears to follow more closely the changes in pH.

Stations 3, 4 and 5 exhibit a ten-fold increase from morning to afternoon, with concentrations peaking about 3:00 p.m. and then tapering off through the evening. Stations 7, 8 and 9 show less variation during the day than Stations 3, 4 and 5. Un-ionized ammonia concentration at these sampling stations, near Fruita, consistently have two peaks: a lesser one in mid-morning and a higher peak in mid-afternoon. The drop in un-ionized ammonia at noon occurs at all sampling points. The two washes show more dramatic increases in un-ionized ammonia and slightly higher concentration ranges compared to the river stations.

DISCUSSION

Results from the two intensive surveys and from the weekly sampling events show diurnal fluctuations of river characteristics which affect the concentration of un-ionized ammonia. In particular, temperature exhibits the most consistent daily pattern in both the intensive surveys and the weekly sampling. An increase of approximately 3 to 4° C appears to occur from morning to evening throughout the year, regardless of absolute temperature. Measurements for pH show slight diurnal fluctuations, though no consistent pattern is apparent throughout the year. (Although the intensive surveys showed an increasing trend in pH during the course of a day, the weekly sampling results did not support this trend. In most cases, the pH exhibited only minor fluctuations--about 0.1 to 0.3 pH units--throughout each sampling event.) Total ammonia levels, unlike temperature and pH, appear to be independent of time of day. Overall, the combined effect of the variations in these three parameters indicates that the concentration of un-ionized ammonia varies with time of day.

For these reasons, results from the study were "time-adjusted" to one reference time. Time-adjusted un-ionized ammonia, as shown in Appendix A, was determined on the basis of the observed trends in temperature during the summer and winter intensive surveys. This enables valid comparisons to be made between upstream and downstream stations or between weekly sampling events. As a conservative measure, the worst-case time of day, usually about 3:00 p.m., was chosen as the reference time.